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2023-2024 CATALOG

The statements set forth in the Catalog are for informational purposes only and should not be construed as the basis of a contract between a student and the Institute.

While the provisions of the Catalog will ordinarily be applied as stated, Georgia Tech reserves the right to change any provision listed in the Catalog, including but not limited to academic requirements for graduation, without actual notice to individual students. Every effort will be made to keep students advised of any such changes. Information regarding any changes will be available through the Office of the Registrar, the Office of the Vice President for Student Life and Dean of Students, and the Schools and Colleges. It is especially important for each student to note that it is their own responsibility to be aware of current requirements for a chosen degree program.

This edition of the Catalog takes effect in Summer Session 2023 and shall remain in effect through Spring Semester 2024.

GOVERNANCE

- University System of Georgia (USG) Member Institutions
- Office of the President
- Deans
- Accreditation

Member Institutions

Research Universities

- Augusta University
- Georgia Institute of Technology
- Georgia State University
- University of Georgia

Comprehensive Universities

- Georgia Southern University
- Kennesaw State University
- University of West Georgia
- Valdosta State University

State Universities

- Albany State University
- Armstrong State University
- Clayton State University
- Columbus State University
- Fort Valley State University
- Georgia College and State University
- Georgia Southwestern State University
- Middle Georgia State University
- Savannah State University
- University of North Georgia

State Colleges

- Abraham Baldwin Agricultural College
- Atlanta Metropolitan State College
- Bainbridge State College
- College of Coastal Georgia
- Dalton State College
- Darton State College
- East Georgia State College
- Georgia Gwinnett College
- Georgia Highlands College
- Gordon State College
- South Georgia State College

Office of the President

President

Ángel Cabrera
President

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Executive President for Research

Daren Hubbard
Interim Executive Vice President for Administration and Finance and Interim Chief Business Officer

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Provost and Executive Vice President for Academic Affairs

Frank Neville
Senior Vice President for Strategic Initiatives and Chief of Staff

President's Cabinet

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Director of Athletics

Skye Duckett
Vice President and Chief Human Resources Office

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Vice President for Institute Diversity, Equity, and Inclusion

Jim Fortner
Vice President for Finance and Planning and Interim Chief Financial Officer

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Laurence Jacobs
Senior Vice Provost for Education and Learning

Bert Reeves
Vice President of Institute Relations

Louise Russo
Interim Vice President of Institute Communications and Assistant Vice President of Strategic Marketing

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Scheller College of Business

Nelson C. Baker
Georgia Tech Professional Education

Raheem Beyah
College of Engineering

Kaye Husbands Fealing
Ivan Allen College of Liberal Arts

Ellen M. Bassett
College of Design

Interim DeanAlex Orso
College of Computing

Susan Lozier
College of Sciences

Leslie Sharp
Georgia Tech Library

Accreditation

Georgia Institute of Technology is accredited by the Southern Association of Colleges and Schools Commission on Colleges (SACSCOC) to award baccalaureate, masters, and doctorate degrees. Georgia Institute of Technology also may offer credentials such as certificates and diplomas at approved degree levels.

Questions about the accreditation of Georgia Institute of Technology may be directed in writing to the Southern Association of Colleges and Schools Commission on Colleges at 1866 Southern Lane, Decatur, GA 30033-4097, by calling (404) 679-4500, or by using information available on SACSCOC's website (www.sacscoc.org).

Scheller College of Business
All Degree Programs
Association to Advance Collegiate Schools of Business (AACSB International)

College of Computing
Bachelor of Science in Computer Science
ABET

School of Interactive Computing and School of Literature, Media & Communication
Bachelor of Science in Computational Media
ABET

College of Design
School of Architecture
Master of Architecture (2 year Track)
National Architecture Accrediting Board (NAAB)

School of Architecture
Master of Architecture (3 year Track)
National Architecture Accrediting Board (NAAB)

School of City and Regional Planning
Master of City and Regional Planning
Planning Accreditation Board (PAB)

School of Industrial Design
Bachelor of Science in Industrial Design
National Association of Schools in Art and Design (NASAD)

School of Industrial Design
Master of Industrial Design
National Association of Schools in Art and Design (NASAD)

College of Engineering
School of Aerospace Engineering
Bachelor of Science in Aerospace Engineering
ABET

School of Biomedical Engineering
Bachelor of Science in Biomedical Engineering
ABET

School of Chemical and Biomolecular Engineering
Bachelor of Science in Chemical and Biomedical Engineering
ABET

School of Civil and Environmental Engineering
Bachelor of Science in Civil Engineering
ABET

School of Civil and Environmental Engineering
Bachelor of Science in Environmental Engineering
ABET

School of Electrical and Computer Engineering
Bachelor of Science in Computer Engineering
ABET

School of Electrical and Computer Engineering
Bachelor of Science in Environmental Engineering
ABET

School of Industrial Systems Engineering
Bachelor of Science in Industrial Engineering
ABET

School of Materials Science and Engineering
Bachelor of Science in Materials Science and Engineering
ABET

School of Mechanical Engineering
Bachelor of Science in Mechanical Engineering
ABET

School of Mechanical Engineering
Bachelor of Science in Nuclear and Radiological Engineering
ABET

School of Mechanical Engineering
Master of Science in Medical Physics
Commission on Accreditation of Medical Physics Educational Programs (CAMPEP)

School of Mechanical Engineering
PhD with a Major in Nuclear and Radiological Engineering
Commission on Accreditation of Medical Physics Education Programs (CAMPEP)

Division of Student Affairs
Counseling Center
International Accreditation of Counseling Services (IACS)

Counseling Center
Pre-Doctoral Internship Training Program in Psychology for Doctoral Students in Counseling and Clinical Psychology Programs
American Psychological Association (APA)

Professional Education
Georgia Tech Language Institute
Intensive English Program

Commission on English Language Program Accreditation (CEA)

COLLEGES AND SCHOOLS

- College of Computing
- College of Design
- College of Engineering
- College of Sciences
- Ivan Allen College of Liberal Arts
- Scheller College of Business

College of Computing

The founding of the College of Computing in 1990 as a focal point for the interdisciplinary advancement of computing caps a history that began in 1963 with the establishment of the School of Information Science. In 1972, this school was succeeded by the School of Information and Computer Science, the immediate predecessor of the current College of Computing. The College of Computing at Georgia Tech is one of the first college-level units devoted to the study of computing in the country.

Computing is an important basis for many activities and is a natural and powerful partner with a variety of other disciplines. The College offers instructional and research programs in many areas, including algorithms and data structures; intelligent systems, machine learning, artificial intelligence, and robotics; computer architecture; cognitive science; databases; distributed and parallel systems; educational technology; graphics and visualization; human-computer interaction; cybersecurity; social computing; networking and telecommunications; operating systems; parallel architectures; programming languages; software engineering; and theories of automata and computation.

Beginning in Fall 2006, the College's undergraduate program was organized around the Threads program developed by College of Computing faculty. A Thread is an intuitive, flexible, and mutually strengthening set of courses that allows students to craft a distinctive future in any computing-related field. Based on their particular interests, students pursuing a BS in Computer Science will choose two Threads—from: modeling and simulation; devices; theory; information internetworks; intelligence; media; people; or systems and architecture—in order to weave a technical degree with a broad collection of skills and learning experiences they need to thrive in a globally competitive world. This approach allows the computing program to retain its strong computing foundations yet encourages partnerships with the multitude of disciplines affected by computing and technology. The Threads also represent minors for students outside of computing who wish to pursue a focused computing minor. Undergraduates who want an even stronger foundation without earning a BS in Computer Science may pursue one of our joint degrees… which are also threaded:

- bachelor's degrees in computer science (CS),
- bachelor's degrees in computational media (jointly with the School of Literature, Media, and Communication and the School of Music), and
- bachelor's degrees in computer engineering (jointly with the School of Electrical and Computer Engineering)

In addition to our undergraduate degrees and minors, the College also offers over a dozen Master's degrees and PhDs in fields as diverse as human-computer interaction; Algorithms, Combinatorics, and Optimization; Robotics; and Machine Learning. All but one of these degrees crosses Schools in the College and more than half are joint with other Colleges.

This interdisciplinary nature is also reflected in our interdisciplinary research programs. For more information, please visit our web pages at: https://www.cc.gatech.edu/

The following undergraduate computing programs are accredited by the Computing Accreditation Commission of ABET, www.abet.org:

- Bachelor of Science in Computer Science
- Bachelor of Science in Computational Media

- Algorithms, Combinatorics, and Optimization. PhD
- Analytics. MS
- Bioengineering. MS, PhD
- BioInformatics. MS, PhD
- Computational Media. BS
- Computational Science and Engineering. MS, PhD
- Computer Science. BS, MS, PhD
- Computing and Business. Minor
- Computing and Devices. Minor
- Computing and Information Internetworks. Minor
- Computing and Intelligence. Minor
- Computing and People. Minor
- Computing & Systems and Architecture. Minor
- Computing and Theory. Minor
- Cybersecurity. MS
- Human-Computer Interaction. MS
- Human-Centered Computing. PhD
- Machine Learning. PhD
- Robotics. MS, PhD

School of Computational Science and Engineering

The School of Computational Science and Engineering (CSE) was established in 2005 to strengthen and better reflect the critical role that computation plays in the science and engineering disciplines at Georgia Tech and the broader technology community. At Georgia Tech, CSE is *the academic discipline devoted to the systematic study and application of computer-based models of natural and engineered systems*. This definition contains two significant elements. First, it acknowledges the essential role that computing and data play in scientific discovery and design and innovation in engineering. Secondly, by referring to CSE as a *discipline*, it recognizes that CSE has its own distinct body of knowledge.

As a school in the College of Computing, CSE supports interdisciplinary research and education in computer science, data science, and applied mathematics. CSE is designed to innovate and create new expertise, technologies, and practitioners.

CSE bridges the gap between traditional computer science (CS) and computational research in science, engineering, medical, and social domains. The School is currently developing programs that immerse students in computing with real-world computational problems and applications. Developing solutions to difficult computation problems that allow all the richness, subtleties, and requirements of the domain to be adequately considered or addressed is crucial.

CSE is concerned with those technologies that lie at the boundary between computer science, data science, and science and engineering. These areas include:

- high performance computing
- scientific and numerical computing
- modeling and simulation
- discrete algorithms
- large-scale data and visual analytics

CSE involves deep collaboration with scientists and engineers, as well as traditional computer scientists. Therefore, school faculty team up with researchers and educators working in high impact areas both at Georgia Tech and at peer research organizations, including national laboratories and industry research labs. Current projects span the following areas:

- aerospace engineering
- computational chemistry
- computational biology and genomics
- civil and environmental engineering
- earth sciences
- health sciences and healthcare informatics
- industrial and systems engineering
- materials science and manufacturing
- mechanical engineering
- neuroscience
- social good and sustainable development
- urban systems and smart cities

Master's Degrees

- Master of Science in Computational Science and Engineering
- Master of Science in Computer Science
- Master of Science in Analytics
- Master of Science in Bioengineering
- Master of Science in BioInformatics

Doctoral Degrees

- Doctor of Philosophy with a Major in Computational Science and Engineering
- Doctor of Philosophy with a Major in Computer Science
- Doctor of Philosophy with a Major in Machine Learning
- Doctor of Philosophy with a Major in Bioengineering
- Doctor of Philosophy with a Major in Bioinformatics

Graduate Study in Computational Science and Engineering

Master's Degrees

- Master of Science in Computational Science and Engineering
- Master of Science in Computer Science
- Master of Science in Analytics
- Master of Science in Bioengineering

Doctoral Degrees

- Doctor of Philosophy with a Major in Computational Science and Engineering
- Doctor of Philosophy with a Major in Computer Science
- Doctor of Philosophy with a Major in Machine Learning
- Doctor of Philosophy with a Major in Bioengineering
- Doctor of Philosophy with a Major in Bioinformatics

Graduate Cooperative Programs

The Graduate Cooperative Education Program provides master's and doctoral degree students majoring in any discipline at Georgia Tech the opportunity to supplement their graduate studies with specialized work experience. Graduate co-op students gain experience with top employers, earn competitive salaries to help defray educational expenses, and expand post-graduation career options while on semester-long work assignments.

The Graduate Co-op Program is available to enrolled Georgia Tech students and is based upon academic achievement. Internships related to a student's field of study can receive academic approval as a graduate cooperative work assignment allowing students to work summer, fall, or spring semesters, full-time or part-time.

There are no fees associated with the Graduate Co-op Program and students are provided full-time enrollment status through their registration in a Graduate Co-op course. This permits students to retain all privileges of full-time enrolled students while on work assignments.

To participate in the Graduate Co-op Program, a student must

- have a 3.0 or better GPA,
- complete an online orientation session, and
- obtain a program participation letter from their major school.

Students normally identify their own job opportunities, but the Graduate Co-op Office provides access to a job posting database and can assist with career guidance, job searches, resumes, and cover letters. Graduate students accepting a graduate co-op/internship opportunity should see a Graduate Co-op Program advisor regarding offer letters, required academic approvals, registration permits, and any necessary work authorizations. Enrollment in a 6000-level co-op course, a noncredit/no-cost audit course with no student or Institute fees attached, is also required.

International students are eligible to participate, but F-1 visa holders must be enrolled for a minimum of nine months before being able to work off campus. All international students on F-1, J-1, and other appropriate visas must work with the Office of International Education to secure work authorization documentation.

For more information on the Georgia Tech Graduate Co-op and Internship Program, visit: www.gradcoop.gatech.edu.

School of Computer Science

Computing is an increasingly important and central field for any endeavor. The College represents the breadth and depth of all of Computing. Within the College, the School of Computer Science is home to a group of faculty and researchers with breadth and strength in all aspects of the computational process itself:

- Computer Architecture
- Databases
- Information Security
- Programming Languages and Compilers
- Networks
- Software Engineering
- Systems
- Theory

tThe SCS mission is produce the people, tools, and ideas to power computation into the future.

At the undergraduate level, SCS is an integral part of the College's BS in Computer Science as well as the CoC threads affiliated with the Computer Engineering degree housed in the School of Electrical and Computer Engineering. At the graduate level School of Computer Science students can pursue Master's and PhD degrees in Computer Science, Machine Learning, and as well as many others.

Master's Degrees

- Master of Science in Computer Science
- Master of Science in Cybersecurity
- Master of Science in BioInformatics

Doctoral Degrees

- Doctor of Philosophy with a Major in Computer Science
- Doctor of Philosophy with a Major in Algorithms, Combinatorics & Optimization
- Doctor of Philosophy with a Major in Bioengineering
- Doctor of Philosophy with a Major in BioInformatics
- Doctor of Philosophy with a Major in Machine Learning

Graduate Study in Computer Science

Master's Degrees

- Master of Science in Computer Science
- Master of Science in Cybersecurity
- Master of Science in BioInformatics

Doctoral Degrees

- Doctor of Philosophy with a Major in Computer Science
- Doctor of Philosophy with a Major in Algorithms, Combinatorics & Optimization
- Doctor of Philosophy with a Major in Bioengineering
- Doctor of Philosophy with a Major in BioInformatics

Bioengineering Programs

In response to the increased need for engineers and medical scientists with advanced training in bioengineering, Georgia Tech now offers master's and PhD degrees in bioengineering. The purpose of bioengineering as a research discipline is

- to develop new and better physical and mathematical concepts and techniques that may be applied to problems in medicine and biology,
- to the development of new medical technologies, and
- to the organization and delivery of cost-effective healthcare.

Interdisciplinary graduate programs in Bioengineering are offered by the College of Computing in conjunction with the Bioengineering Center in the Office of Interdisciplinary Programs, the College of Engineering, and the College of Sciences. The student's home unit will be the College of Computing, which, upon completion of the student's requirements, will recommend the degree. This interdisciplinary approach has been approved by the faculty in the Schools of Aerospace Engineering, Chemical and Biomolecular Engineering, Electrical and Computer Engineering, Materials Science and Engineering, Mechanical Engineering, and Polymer, Textile and Fiber Engineering, and by the deans of the Colleges of Computing, Engineering, and Sciences.

The program is for computer science or engineering graduates who wish to pursue a degree in bioengineering rather than in a traditional field of computing or engineering, or who have done bioengineering research in other disciplines. In addition, those interested students with non-engineering backgrounds (with degrees in such fields as physics, chemistry, biology, or mathematics) who meet the admission requirements will be admitted to the program. Applications from physicians with undergraduate degrees in engineering or the physical sciences will also be considered. All applications will be processed through the Bioengineering Center.

Additional information is available at www.bme.gatech.edu.

Master of Science in Bioengineering

Doctor of Philosophy with a Major in Bioengineering

Graduate Cooperative Programs

The Graduate Cooperative Education Program provides master's and doctoral degree students majoring in any discipline at Georgia Tech the opportunity to supplement their graduate studies with specialized work experience. Graduate co-op students gain experience with top employers, earn competitive salaries to help defray educational expenses, and expand post-graduation career options while on semester-long work assignments.

The Graduate Co-op Program is available to enrolled Georgia Tech students and is based upon academic achievement. Internships related to a student's field of study can receive academic approval as a graduate cooperative work assignment allowing students to work summer, fall, or spring semesters, full-time or part-time.

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- complete an online orientation session, and
- obtain a program participation letter from their major school.

Students normally identify their own job opportunities, but the Graduate Co-op Office provides access to a job posting database and can assist with career guidance, job searches, resumes, and cover letters. Graduate students accepting a graduate co-op/internship opportunity should see a Graduate Co-op Program advisor regarding offer letters, required academic approvals, registration permits, and any necessary work authorizations. Enrollment in a 6000-level co-op course, a noncredit/

no-cost audit course with no student or Institute fees attached, is also required.

International students are eligible to participate, but F-1 visa holders must be enrolled for a minimum of nine months before being able to work off campus. All international students on F-1, J-1, and other appropriate visas must work with the Office of International Education to secure work authorization documentation.

For more information on the Georgia Tech Graduate Co-op and Internship Program, visit: www.gradcoop.gatech.edu.

School of Interactive Computing

Interactive and intelligent computing is an emerging discipline on the frontier of ways computation impacts the external world. The School of Interactive Computing advances computing-mediated interactions by encompassing fields ranging from artificial intelligence and machine learning to graphics and computer vision to interface design and empirical methods. We don't just evaluate technology, we create technology that makes interactions better. Much of the research within the School of Interactive Computing produces new artifacts that embody new capabilities or methods. Examples include:

- Individuals working with traditional computers
- Groups of people using ubiquitous computing capabilities throughout various environments
- Researchers visualizing scientific data
- Students developing and altering middle school physics simulations
- Automated intelligent surveillance systems monitoring airport tarmacs
- Robots delivering pharmaceuticals to patients in hospitals

Whether an advance is in robotics, augmented reality, or ubiquitous computing, it is developed in the context of a prototype. School of Interactive Computing students become proficient in many areas such as mechanical or electrical engineering, and industrial design. The School of Interactive Computing develops practitioners, future innovators and researchers by offering numerous degree programs.

At the undergraduate-level, the School of Interactive Computing is an integral part of the College's BS in Computer Science, and oversees aspects of Computational Media's Bachelor's degree-offered jointly with the School of Literature, Communication and Culture (LMC) and the School of Music. The School of Interactive Computing also administers the interdisciplinary Master's in Human Computer Interaction (HCI) program in which students from the School of Interactive Computing, LMC, and Psychology participate. At the graduate-level the School of Interactive Computing students can pursue Master's and PhD degrees in Computer Science, or a PhD in Human-Centric Computing—the first of its kind in the nation—a Robotics PhD, and others.

Master's Degrees

- Master of Science in Computer Science
- Master of Science in Human-Computer Interaction
- Master of Science in Robotics

Doctoral Degrees

- Doctor of Philosophy with a Major in Computer Science
- Doctor of Philosophy with a Major in Human-Computer Interaction
- Doctor of Philosophy with a Major in Machine Learning
- Doctor of Philosophy with a Major in Robotics

Graduate Study in Interactive Computing

Master's Degrees

- Master of Science in Computer Science
- Master of Science in Human-Computer Interaction
- Master of Science in Robotics

Doctoral Degrees

- Doctor of Philosophy with a Major in Computer Science
- Doctor of Philosophy with a Major in Human-Computer Interaction
- Doctor of Philosophy with a Major in Machine Learning
- Doctor of Philosophy with a Major in Robotics

Graduate Cooperative Programs

The Graduate Cooperative Education Program provides master's and doctoral degree students majoring in any discipline at Georgia Tech the opportunity to supplement their graduate studies with specialized work experience. Graduate co-op students gain experience with top employers, earn competitive salaries to help defray educational expenses, and expand post-graduation career options while on semester-long work assignments.

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- complete an online orientation session, and
- obtain a program participation letter from their major school.

Students normally identify their own job opportunities, but the Graduate Co-op Office provides access to a job posting database and can assist with career guidance, job searches, resumes, and cover letters. Graduate students accepting a graduate co-op/internship opportunity should see a Graduate Co-op Program advisor regarding offer letters, required academic approvals, registration permits, and any necessary work authorizations. Enrollment in a 6000-level co-op course, a noncredit/ no-cost audit course with no student or Institute fees attached, is also required.

International students are eligible to participate, but F-1 visa holders must be enrolled for a minimum of nine months before being able to work off campus. All international students on F-1, J-1, and other appropriate visas must work with the Office of International Education to secure work authorization documentation.

For more information on the Georgia Tech Graduate Co-op and Internship Program, visit: www.gradcoop.gatech.edu.

College of Design

Location:
East Architecture Building
245 Fourth Street NW
Atlanta, Georgia 30332-0155

Phone: 404.894.3880
Fax: 404.894.2678

Website: www.design.gatech.edu
Faculty: www.design.gatech.edu/people/faculty

College established in 1975. Renamed in 2016.

General Information

The College of Design is comprised of five schools – Architecture, Building Construction, City and Regional Planning, Industrial Design, and Music. As a multidisciplinary venue for teaching, research, and service, the College brings together a distinct array of undergraduate and graduate degree offerings that address the designed, built, and lived environments. Through its seven research centers, the College drives innovation in education and professional practice by solving critical problems in building and cities, and improving the quality of life for diverse populations.

The College of Design offers four undergraduate degrees, eleven master's degrees, and four doctoral degrees. Detailed descriptions of these programs can be found under the appropriate school headings.

- Architecture. Minor, BS, M.Arch, MS, PhD
- Building Construction. BS, PhD
- Building Construction and Facility Managment. MS
- City and Regional Planning. MCRP, PhD
- Computational Media. BS
- Geographic Information Science and Technology. MS
- Human-Computer Interaction. MS
- Industrial Design. Minor, BS, M.ID
- Occupational Safety and Health. PMOSH
- Real Estate Development. MRED
- Music Technology. Minor, BS, MS, PhD
- Sustainable Cities. Minor
- Urban Design. MS

The College of Design also offers opportunities for credit sharing between the programs listed below to earn two degrees. Click here for more information.

- Master of City & Regional Planning and Master of Architecture
- Master of City & Regional Planning and Master of Science in Civil Engineering
- Master of City & Regional Planning and Master of Science in Public Policy
- Master of City & Regional Planning and JD in Planning Law (cooperative agreement with Georgia State)

School of Architecture

Location:
East Architecture Building
245 Fourth Street NW
Atlanta, Georgia 30332-0155

Phone: 404.894.4885
Fax: 404.894.2678

Website: www.arch.gatech.edu
Faculty: www.arch.gatech.edu/people

Architecture was established as a discipline at Georgia Tech in 1908, and the graduates of the program have helped shape the growth and physical climate of Atlanta, the region and the world. As the largest of the five units in the College of Design, the School of Architecture has several distinct degree programs, a reflection of its multiple missions. The undergraduate program, the Bachelor of Science in Architecture, advances Georgia Tech's general education mission through a studio-based design curriculum providing a thorough grounding in liberal and technological knowledge.

At the core of the School is the professional program in architecture, the Master of Architecture, one requirement leading to licensure as a practicing architect. In addition, advanced study and research programs, including the Master of Science with a major in Architecture, the Master of Science in Urban Design, and the Doctor of Philosophy with a major in Architecture, build linkages with practice and industry and exploit the creative tensions between research and design that drives innovation in the field.

Resources such as the Digital Building Laboratory, the Digital Fabrication Laboratory, and the SimTigrate Lab for health and design, support a culture of research focused on building performance and innovation in the field.

All work produced in the College of Design as part of a degree program becomes the property of the College; it may be retained or returned at the discretion of the faculty. The faculty also reserves the right to refuse for credit any project executed outside the precincts of the College or otherwise produced without proper coordination with the faculty.

In the United States, most registration boards require a degree from an accredited professional degree program as a prerequisite for licensure. The National Architectural Accrediting Board (NAAB), which is the sole agency authorized to accredit professional degree programs in architecture offered by institutions with U.S. regional accreditation, recognizes three types of degrees: the Bachelor of Architecture, the Master of Architecture, and the Doctor of Architecture. A program may be granted an eight-year, three-year, or two-year term of accreditation, depending on the extent of its conformance with established educational standards.

Doctor of Architecture and Master of Architecture degree programs may require a preprofessional undergraduate degree in architecture for admission. However, the preprofessional degree is not, by itself, recognized as an accredited degree.

The Georgia Institute of Technology, School of Architecture, offers the following NAAB-accredited degree programs:

- M.Arch. (preprofessional degree in Architecture + 60 graduate credits)
- M.Arch. (non-preprofessional degree + 102 credits)

Next accreditation visit for all programs: 2022

Minors

- Minor in Architecture

Bachelor's Degrees

- Bachelor of Science in Architecture

Master's Degrees

- Master of Architecture
  - Click here for credit sharing opportunity with Master of City and Regional Planning
- Master of Science in Architecture
- Master of Science in Urban Design

Doctoral Degrees

- Doctor of Philosophy with a Major in Architecture

Graduate Study in Architecture

Graduate studies in architecture at Georgia Tech are comprised of four distinct degree-granting programs:

- Master of Architecture (M.Arch) STEM-designated
- Master of Science in Urban Design (MSUD) STEM-designated
- Master of Science in Architecture (MS Arch) with several possible research emphases. STEM-designated
- Doctor of Philosophy with a major in Architecture (PhD).

The M.Arch program is the professional program in architecture leading to the NAAB-accredited Master of Architecture degree. This program accommodates both a two-year curriculum for those students with a four-year, pre-professional degree in architecture and a three-and-a-half-year curriculum for those students without a pre-professional degree in architecture.

The MSUD is oriented to those who wish to expand upon their previous professional education and professional experience, as architects, landscape architects, city planners, or civil engineers, and to enter urban design practices either in private firms or public agencies. The program is interdisciplinary in nature, offering an interdisciplinary experience, with required courses in urban design, architecture, and city planning, with additional opportunities in civil and environmental engineering, real estate development, heritage preservation, and other fields. Students in the MSUD program are in daily contact with architecture and planning students and faculty throughout the College of Architecture. The MSUD program requires a minimum of 39 credit hours of coursework.

The MS Arch is a nonprofessional, research-oriented degree program that requires a minimum of 30 credit hours of coursework. Current research areas are available in Advanced Production, High Performance Buildings, Design & Health, Design Computation and Building Information Systems. These MS program provides a rich array of studios and courses that engage particular aspects of architectural knowledge and practice.

Within the School of Architecture, the Ph.D with a major in Architecture develops knowledge and technologies:

- enhances design imagination, design evaluation, and the design process;
- articulates design choices and predicts the consequences of design decisions;
- helps to learn from precedents;
- supports better building performance; and
- situates the practice of architecture within a critical understanding of culture, history, and the profession

Our program includes research emphases in:

- Design Computation
- Architecture Culture and Behavior/Evidence-based Design
- Building Technology and Performance
- History and Culture
- Urban Design

In each of these research areas, we intersect the perspectives of architectural design, science, technology, and the humanities even as we expect individual research projects to rigorously pursue specific disciplinary agendas.

For more information about graduate programs in the School of Architecture, please contact

Robin Tucker, Academic Advising Manager -
robin.tucker@design.gatech.edu
School of Architecture, 245 Fourth Street
Georgia Institute of Technology
Atlanta, Georgia 30332-0155
website: www.arch.gatech.edu

The School of Architecture encourages foreign study for all students to prepare them professionally and personally for successful lives in the global environment of the twenty-first century. Students may participate in an immersive experience at another institution or participate in a Georgia Tech faculty-led program.

The School of Architecture sponsors several international programs organized and led by its own faculty:

- Modern Architecture and the Modern City - Graduate Students
- Greece-Italy Study Abroad Program - Undergraduate/Graduate Students
- Tongji University-Georgia Tech Exchange Program- Master of Architecture Students
- Design Develop Build Program in Africa - Undergraduate/Graduate Students

For current offerings, visit https://arch.gatech.edu/international-education

Undergraduate Study in Architecture

Minors

- Minor in Architecture

Bachelor's Degrees

- Bachelor of Science in Architecture

The School of Architecture offers three certificate programs for which undergraduate students may apply:

1. **Architecture and Society** – provides an opportunity to explore the technological and formal innovations of architecture and infrastructure within their socio-political and cultural contexts. Students will learn not only about buildings' technical systems – and their material, structural and climatic performance – but also about their formal order, siting, use, funding/patronage, relation to nature or the city, decoration, and multiple interpretive contexts.
2. **Sustainable Architecture** – provides undergraduate students the opportunity to specialize in design and technical innovations that will increase building energy performance, reduce emissions, use eco-friendly materials, and thereby increase the durable societal value of the built environment.
3. **Computational Design** – prepares students to develop a skill set in computer-aided design and fabrication built upon an integrated application of design research, architectural geometry, digital theory and digital design technologies in contemporary architectural practice and research.

Certificates will be granted only to students who, in addition to the certificate program requirements, have satisfied requirements for a Georgia Tech degree. Each certificate requires a minimum of twelve credit hours, at least nine of which are at the 3000 level or higher in the designated area. Courses required by a student's program of study may not be credited by that student toward a certificate. Courses counting toward a certificate must be taken on a letter-grade basis, and a "C" or better must be received in each course.

Interested students should visit the Georgia Tech Catalog for more information.

The School of Architecture encourages foreign study for all students to prepare them professionally and personally for successful lives in the global environment of the twenty-first century. Students may participate in an immersive experience at another institution or participate in a Georgia Tech faculty-led program.

The School of Architecture currently runs the following faculty-led programs:

- Summer Study in Greece and Italy (open to students of all majors)
- Undergraduate International Studio (restricted to students in the B.S in Architecture program)
- Design Develop Build Program in Africa (restricted to students majoring in Architecture)
- International Urban Design Studio (restricted to students majoring in Architecture)
- Barcelona Study Abroad Program in Spain (open to students of all majors)

School of Building Construction

Graduates of the School of Building Construction manage construction sites with new technologies and access to Georgia Tech's global research and education influence.

While we certainly understand how to build buildings, we see the job as so much more than that. Where others might see a wall of numbers, we look at efficiency studies and forecasting methods and see how lives are changed by the built environment. Whether we're using drones to perform safety inspections or developing new models to predict investment values, we are creating the next generation of sustainable, cost-effective construction practices.

Our academic programs in building construction — the Bachelor of Science in Building Construction , the Master of Science in Building Construction and Facility Management, the Master in Real Estate Development, the Professional Master's in Occupational Safety and Health, the undergraduate certificate in construction management, and our Ph. D. in Building Construction — address entire life cycles of building projects. From site selection through architectural design, engineering, financing, facilities management, sustainability, and energy/resource footprint to eventual renovation or demolition, we merge the creative with the practical to deliver the built environment.

We study how building projects address the needs of their society, the environment, and the economy, and how the built environment shapes those areas in turn. We work across multiple disciplines — architecture, engineering, finance, city planning, and public policy — to meet advancing needs for efficient, sustainable building practices.

The Facility Management program within the Master of Science in Building Construction and Facility Management is accredited by the Accreditation Board for Engineering and Technology (ABET). The accreditation ensures the School continues to meet the standards set by the International Facility Management Association (IFMA) for quality facility management education.

Bachelor's Degree

- Bachelor of Science in Building Construction

Master's Degree

- Master of Science in Building Construction and Facility Management
- Master of Real Estate Development
- Professional Master's in Occupational Safety and Health

Doctoral Degree

- Doctor of Philosophy with a Major in Building Construction

Certificate Programs

The School of Building Construction offers a certificate in Construction Management, which is available to students in all majors at Georgia Tech. The certificate is designed to provide a specialized education in evolving integrated management approaches to the delivery of built environment, from concept to implementation. The certificate exposes students to the multi-disciplinary nature of construction project development and management and introduces them to the latest technologies and processes developed to enhance interdisciplinary collaboration and integration.

Certificates will be granted only to students who, in addition to the certificate program requirements, have satisfied requirements for a Georgia Tech degree. Each certificate requires a minimum of twelve credit hours, at least nine of which are at the 3000 level or higher in the designated area. Courses required by a student's program of study may not be credited by that student toward a certificate. Courses counting toward a certificate must be taken on a letter-grade basis, and a C or better must be received in each course.

Interested students should consult http://bc.gatech.edu/content/undergraduate-certificate and consult with an academic advisor for more details.

Graduate Study in Building Construction

Graduate Programs

- Master of Science in Building Construction and Facility Management
- Master of Real Estate Development
- Professional Master's in Occupational Safety and Health
- Doctor of Philosophy with a Major in Building Construction

Contact Information

School of Building Construction
College of Design
Georgia Institute of Technology
280 Ferst Dr.
Atlanta, GA 30332-0680

Phone: 404.894.4875
Fax: 404.894.1641

Departmental Resources

- Building Construction website
- Information for master's degree students
- Information for doctoral degree students

Office of Graduate Studies

- Building Construction and Facility Management

Rules and Regulations

The Catalog is the authoritative source of Rules and Regulations and other Policies for Georgia Tech students.

Approved Electives

Students have several options to customize their graduate study through professional electives. Graduate students may select their approved electives from the core of the other Building Construction concentrations, from a rotating list of BC electives, and from other academic area including: City Planning, Public Policy, Management, Architecture, and Engineering.

Undergraduate Study in Building Construction

Bachelor's Degree

- Bachelor of Science in Building Construction

Undergraduate Certificate

- Undergraduate Certificate in Construction Management

School of City and Regional Planning

Founded in 1952, Georgia Tech's planning school is one of the oldest professional planning programs in the United States, with more than 1,500 alumni. Graduates are employed in public, private, and third sectors, including all levels of government, real estate development firms, planning consultancies, banks, public utilities, community development corporations, universities, research organizations, and public interest groups. The School's Master of City and Regional Planning program is fully accredited by the Planning Accreditation Board.

Our institutional setting within the College of Design and one of the world's premiere technology universities enables students to acquire expertise in every area of the urban development process, including planning, design, construction/engineering, and management. The School of City and Regional Planning is home to four research centers:

- Georgia Center for Quality Growth and Regional Development
- Center for Spatial Planning Analytics and Visualization
- Sino-U.S. Eco-urban Lab
- Urban Climate Lab

These centers plus Georgia Tech's Economic Innovation Institute, Georgia Transportation Institute, Brook Byers Institute for Sustainable Systems, and renowned co-op program, provide hands-on practice and research experience for many of our graduate students.

The Master of City and Regional Planning (MCRP) program offered by the School of City and Regional Planning is fully accredited by the Planning Accreditation Board, a joint accrediting body of the American Institute of Certified Planners, the American Planning Association, and the Association of Collegiate Schools of Planning.

The MCRP degree is the recognized basis for a career as a professional planner.

Minors

- Minor in Sustainable Cities

Master's Degrees

- Master of City and Regional Planning
  - Click here for credit sharing/cooperative agreements with the following programs to earn two degrees.
    - Master of City & Regional Planning and Master of Architecture
    - Master of City & Regional Planning and Master of Science in Civil Engineering
    - Master of City & Regional Planning and Master of Science in Public Policy
    - Master of City & Regional Planning and JD in Planning Law (cooperative agreement with Georgia State)
- Master of Science in Geographic Information Science and Technology

Doctoral Degree

- Doctor of Philosophy with a Major in City and Regional Planning

Certificate in Real Estate Development

Georgia Tech undergraduates in good standing may complete a Certificate in Real Estate Development offered by the School of City and Regional Planning in collaboration with the School of Building Construction and the Scheller College of Business. The certificate is designed to provide specialized education in land real estate development making our students more competitive in securing employment and in advancing to graduate education. Students must complete twelve credit hours in required and restricted elective courses,

and maintain a minimum grade point average of 2.7. The certificate is awarded upon graduation or the next semester after graduation.

Certificate in Real Estate Development

Certificate in Geographic Information Systems

The Certificate in Geographic Information Systems is open to both MCRP students and students from other programs. The certificate is structured around three sets of courses, including a foundational course in GIS, two skills related courses, and one policy context course. For City and Regional Planning graduate students, coursework for this certificate can be counted toward the MCRP or PhD degree. Students must complete twelve credit hours in required and restricted elective courses taken on letter-grade basis, and completed with a minimum grade point average of 3.0 or higher. The certificate is awarded upon graduation or the next semester after graduation.

Certificate in Geographic Information Systems

Graduate Study in City and Regional Planning

Graduate Programs

- Master of City and Regional Planning (MCRP)
- Master of Science in Geographic Information Science and Technology
- Doctor of Philosophy with a Major in City and Regional Planning

Dual Degree Programs

- Master of City and Regional Planning & Master of Architecture
- Master of City and Regional Planning & Master of Science in Civil Engineering
- Master of City and Regional Planning & Master of Science in Public Policy
- Master of City and Regional Planning & Juris Doctor
- Master of City and Regional Planning & Master of Science in Geographic Information Science and Technology

Contact Information

School of City and Regional Planning
College of Design
Georgia Institute of Technology
245 Fourth St. NW, Suite 204
Atlanta, GA 30332-0155

Phone: 404.894.2350
Fax: 404.894.1628
Email: crp@design.gatech.edu

Departmental Resources

- City and Regional Planning web site
- Information for MCRP students
- Information for MS in Geographic Information Science and Technology students
- Information for PhD in City and Regional Planning students

Office of Graduate Studies

- City and Regional Planning
- City and Regional Planning program spotlight
- Geographic Information Science and Technology
- Geographic Information Science and Technology program spotlight

Rules and Regulations

The Catalog is the authoritative source of Rules and Regulations and other Policies for Georgia Tech students.

Dual Degrees

The School of City and Regional Planning offers several dual degree programs pairing the Master of City and Regional Planning with allied professional studies. By enrolling in a dual degree program, students are able to obtain two degrees in less time than it would take if the degrees were being pursued separately. Both degrees are awarded simultaneously upon completion of the program of study. Dual degrees position graduates to tackle urban and regional policy problems that would benefit from a multidisciplinary perspective. Dual degrees also position graduates to be competitive for work settings that traditionally involve professionals from multiple fields.

Candidates seeking dual degree program admission should apply to each of the two degree programs separately, indicating in their statements that they are seeking dual degree admission. The two schools involved will each make their decisions independently so that the applicant will have the option to pursue only one degree if not admitted to both degree programs. Please refer to the catalog listings of both degree programs involved, as admissions requirements and deadlines may differ.

- Dual Degree Information

Graduate Certificate Program in Historic Preservation

MCRP students in good standing may cross-enroll at Georgia State University to earn a certificate in heritage preservation with an emphasis on historic preservation. Coursework may be counted toward the MCRP degree.

- Graduate Certificate in Historic Preservation

Graduate Certificate in Geographic Information Systems

The certificate in Geographic Information Systems is open to both MCRP students and students from other graduate programs on campus. The certificate is structured around three sets of courses, including a foundation course in GIS, two skills related courses, and one policy context course. For City and Regional Planning graduate students, coursework for this certificate can be counted toward the MCRP or PhD degree.

- Graduate Certificate in Geographic Information Systems

Undergraduate Study in City and Regional Planning

Minors

- Minor in Sustainable Cities

Certificate in Real Estate Development

- Certificate in Real Estate Development

School of Industrial Design

Industrial design is the professional service of creating and developing concepts and specifications that optimize the function, value, and appearance of products and systems for the mutual benefit of both user and manufacturer. An industrial designer's work touches all of our lives in the form of home products and furnishings, communication devices, healthcare equipment, rehabilitation technologies, and a myriad of other consumer and industrial products and services. While giving form to the efforts of industry, an industrial designer is at the same time a consumer advocate, providing the humanizing link between technology and people. As such, an industrial designer's central responsibilities include fitting the artifact, system, or service to the person through considering appropriate aesthetics and ergonomics, technical processes, requirements for manufacture, marketing opportunities, and economic constraints.

The Georgia Tech School of Industrial Design offers a well-rounded course of study with early emphasis on basic design and design skills. Design projects stress realistic design situations. The program encourages students to develop a diverse background in order to expand individual talents and to respond to changing opportunities in the field. Most faculty members are practicing designers with extensive experience in the field.

Resources such as the Interactive Product Design Lab, the Body Scan Lab, the Human Machine Interaction Transportation Lab and the Digital Fabrication Lab support a culture of research-focused teaching and learning.

The faculty reserves the right to refuse credit for any project executed outside the precincts of the College or otherwise executed without proper coordination with the instructor.

The Bachelor of Science in Industrial Design and the Master of Industrial Design degree programs offered by the School of Industrial Design are accredited by the National Association of Schools in Art and Design (NASAD). Georgia Tech is recognized by the Industrial Designers Society of America (IDSA) as a NASAD-accredited institution.

Minors

- Minor in Industrial Design

Bachelor's Degrees

- Bachelor of Science in Industrial Design

Master's Degrees

- Master of Industrial Design
- Master of Science in Human-Computer Interaction

Graduate Study in Industrial Design

Master's Degrees

The School of Industrial Design at Georgia Tech offers two graduate degree programs.

- Master of Industrial Design
- Master of Science in Human-Computer Interaction

Georgia Tech's Master's of Industrial Design (MID) focuses on an inclusive design approach that is dedicated to the creation and development of products, systems, services and environments that are usable by all segments of the population. With the growing diversity of the population, inclusive design is becoming increasingly important to designers of tomorrow to ensure that design is responsive to the individual and collective needs of all people.

Capitalizing on Georgia Tech's rich traditions in technology and research, the MID program stresses a user-centered design process and evidence-based design practice that offers students unique opportunities to explore the design of new and existing technologies. Faculty members, who are practicing designers and experts in their fields, maintain active research programs in tangible products within communication technologies, enabling environments, supportive product systems, rehabilitation technologies, and healthcare systems technologies.

The interdisciplinary Master of Science in Human-Computer Interaction (HCI) degree program is a cooperative effort of the School of Interactive Computing; the School of Literature, Media and Communication; the School of Industrial Design, and the School of Psychology. The program provides students with the practical *and* interdisciplinary skills and theoretical understanding they will need to become leaders in the design, implementation, and evaluation of the computer interfaces of the future.

For more information about graduate programs in the School of Industrial Design, please contact

Academic Advisor
School of Industrial Design
Georgia Institute of Technology
Atlanta, Georgia 30332-0155

phone: 404.894.4874
website: http://www.id.gatech.edu/

Undergraduate Study in Industrial Design

Minors

- Minor in Industrial Design

Bachelor's Degrees

- Bachelor of Science in Industrial Design

School of Music

The School of Music offers degree programs in music technology at the bachelors, masters, and doctoral levels; a wide range of performance ensembles serving students from all majors on campus; and a series of general education courses about music and music technology, most of which carry the humanities attribute.

The School's bachelors, masters, and doctoral degrees in music technology approach this emerging, interdisciplinary field from scientific, engineering, and creative perspectives. In these programs, students develop their fundamental skills in the analysis, creation, and performance of music; their knowledge of the theory and application behind areas such as acoustics, cognition, signal processing, and interaction design; their ability to use state-of-the-art technologies to create and perform music; their experience in designing and implementing next-generation music technology tools; and their capacity to conduct research studies that expand our knowledge of how humans and machines engage with music. The School also offers a general minor and music technology minor program.

Students across campus participate in the School of Music's vocal and instrumental ensemble courses, including marching, concert, and symphonic bands, jazz ensembles and combos, symphony and chamber orchestras, multiple choirs, and a rock / pop ensemble. Some ensembles require an audition while others are open to all who wish to enroll.

The School also offers general education courses, many of which fulfill the humanities requirement for undergraduates. These courses do not generally have prerequisites or require any prior experience in music.

Much of the research in the School of Music is focused in the Center for Music Technology, which aims to transform the ways we create and experience music through next generation technology for composition, performance, consumption, and education. Research areas in the Center include robotic musicianship, music informatics, brain music, and computational and cognitive musicology.

Minors

- Minor in Music (General)
- Minor in Music Technology

Bachelor's Degree

- Bachelor of Science in Music Technology
- Bachelor of Science in Computational Media

Master's Degree

- Master of Science in Music Technology

Doctoral Degree

- Doctor of Philosophy with a Major in Music Technology

Undergraduate Study in Music Technology

Bachelor's Degree

- Bachelor of Science in Music Technology
- Bachelor of Science in Computational Media

Minors

- Minor in Music (General)
- Minor in Music Technology

Graduate Study in Music Technology

Master's Degree

- Master of Science in Music Technology

Doctoral Degree

- Doctor of Philosophy with a Major in Music Technology

School of Music Humanities Credit Information

Core Area C

For more information, see "Core Curriculum, Core C, General Education" in this Catalog.

Humanities Credit for Ensemble Participation

Students can earn Humanities credit for participation in one or more specified School of Music ensembles. Each ensemble course is repeatable for credit and the following ensembles carry the humanities attribute:

Code	Title	Credit Hours
MUSI 3121	Concert Band	1
MUSI 3131	Symphonic Band	1
MUSI 3231	Chamber Choir	1
MUSI 3241	Chorale	1
MUSI 3251	Glee Club	1
MUSI 3261	Treble Choir	1
MUSI 3311	Jazz Ensemble	1
MUSI 3511	Percussion Ensemble	1
MUSI 3531	New Music Ensemble	1
MUSI 3551	Rock and Pop Ensemble	1
MUSI 3611	Symphony Orchestra	1

Vocal and Instrumental Ensembles

Ensembles

More information on ensembles: https://music.gatech.edu/ensembles

The Chamber Choir

The Chamber Choir is an elite vocal ensemble chosen by audition and performs on campus and community concerts throughout the academic year. The choir rehearses and performs challenging choral music literature written especially for smaller choirs.

The Chorale

A mixed ensemble focused upon the rehearsal, study and performance of choral music. Repertoire may include accompanied and unaccompanied works from all style eras and genres, modern music, world music, and performances of multiple mediums. Choral music experience is recommended. No audition is required.

Glee Club

The Glee Club was organized in 1906 and is the oldest student organization on campus. The Glee Club performs frequently on and off campus. Repertoire includes traditional chorus music, contemporary vocal percussion, and original compositions.

Treble Choir

The Treble Choir performs a variety of accompanied and a cappella music across classical and popular music styles.

Jazz Program

The Georgia Tech Jazz Program provides a great opportunity to study one of America's greatest and most unique art forms. The Jazz Ensembles explore music from the late 1920's through the present day, including works by composers such as Duke Ellington, Bill Holman, Sammy Nestico, Charles Mingus and Pat Metheny. Emphasis in these groups is focused on ensemble playing and the art of improvisation, an essential element in jazz tradition. Typically, two large jazz ensembles are offered each semester, as well as the opportunity to perform in small jazz combos. Each ensemble presents several concerts during an academic semester, in addition to numerous on and off-campus events throughout the year. The Jazz Program also strives to bring professional artists to campus on a regular basis, and students will often have the opportunity to perform with these musicians and clinicians in concert during the year.

Percussion Ensemble

The percussion ensembles meet in the Fall and Spring and focus on traditional and contemporary ensemble literature as well as transcriptions of popular music. These ensembles are offered to students with prior percussion background. Interested students should contact Chris Moore (chris.moore@music.gatech.edu) for permission.

Athletic Bands

The Yellow Jacket Marching Band and Basketball Pep Bands are elements of the Georgia Tech Band Program. The Marching Band and Pep Bands perform at all home games and travel to several out-of-state events, including the ACC Tournament, NCAA Tournament, football games, and bowl appearances. These trips are financed by the Georgia Tech Athletic Association. Tryouts for the auxiliary units are held each spring. Wind and percussion auditions occur at the mandatory band camp held the week before the start of fall classes. More information on athletic bands: http://marchingband.gatech.edu/

Symphonic Band and Concert Band

The Symphonic Band and Concert Band perform masterworks as well as contemporary wind literature designed for the rich sonorities of an expanded instrumentation. The Concert Band provides ensemble performance experiences in a wide range of musical styles and periods for all students at GT. Symphonic Band performs the latest contemporary music as well as standards of the repertoire. Symphonic Band has been involved in commissions of new music from many composers, including Andy Akiho, James David, Steven Bryant, and Julie Giroux. The music performed in these organizations varies from semester to semester and is selected to provide a challenging opportunity for musical growth. By rehearsing and performing at the highest possible level of artistry, each student will be challenged to improve their individual musicianship and ensemble skills. The highest quality repertoire for wind instruments will be the core of the curriculum, allowing for a wide variety in the musical, educational, and philosophical foundations of the course. Auditions are required and take place on the first Tuesday of each semester.

Orchestra

The School of Music currently offers two orchestral ensembles: the Georgia Tech Symphony Orchestra (GTSO, advanced), and Concert Orchestra (intermediate). The orchestra program also provides access to master classes, professional engagements, and recording opportunities. Students are encouraged to pre-register for orchestra and then audition during the first week of each semester.

Rock / Pop Ensemble

The Georgia Tech Rock/Pop ensemble performs repertoire drawn from all styles of American vernacular music from roughly 1950 onwards, as well as derivative genres from overseas. Each semester, the group divides into multiple bands, each exploring one style or era of Rock/Pop music. Each band also performs their own original songs. Guitarists, bassists, drummers/percussionists, keyboardists, brass players, and singers are all invited to audition.

Laptop Orchestra

The Georgia Tech Laptop Orchestra consists primarily of music technology majors. Students in the ensemble learn about audio synthesis, sound design, approaches to notation and improvisation in experimental music, and interactive music programming and instrument design. They present concerts which include music arranged for laptop orchestra, music composed for laptop orchestra, and music created by the students in the ensemble.

College of Engineering

The College of Engineering comprises eight academic units of instruction and research. These units offer programs of study and research leading to bachelor's, master's, and doctoral degrees. Some also offer programs in one or more subdisciplines or subspecialties.

The programs in engineering are designed to provide a fundamental understanding of the engineering sciences (which are based on mathematics and the natural sciences), of the basic concepts of the humanities and social sciences, and an understanding of the manner in which these elements are interwoven in engineering practice. Each curriculum provides enough flexibility through elective course

opportunities to permit a certain amount of program individualism while meeting basic requirements.

The following undergraduate engineering programs are accredited by the Engineering Accreditation Commission of ABET, www.abet.org.

- Bachelor of Science in Aerospace Engineering
- Bachelor of Science in Biomedical Engineering
- Bachelor of Science in Chemical and Biomolecular Engineering
- Bachelor of Science in Civil Engineering
- Bachelor of Science in Computer Engineering
- Bachelor of Science in Electrical Engineering
- Bachelor of Science in Environmental Engineering
- Bachelor of Science in Industrial Engineering
- Bachelor of Science in Materials Science and Engineering
- Bachelor of Science in Mechanical Engineering
- Bachelor of Science in Nuclear and Radiological Engineering

The Master of Science in Medical Physics and the PhD with a major in Nuclear Engineering - Medical Physics Option programs are accredited by the Commission on Accreditation of Medical Physics Educational Programs, CAMPEP, www.campep.org/campeplstgrad.asp.

- Aerospace Engineering. Minor, BS, MS, PhD
- Algorithms, Combinatorics, and Optimization. PhD
- Analytics. MS
- Applied Systems Engineering. PMASE
- Bioengineering. MS, PhD
- Bioinformatics. PhD
- Biomedical Engineering. Minor, BS, MS, PhD
- Biomedical Innovation and Development. MBID
- Chemical and Biomolecular Engineering. BS
- Chemical Engineering. MS, PhD
- Civil Engineering. BS, MS, PhD
- Computational Science and Engineering. MS, PhD
- Computer Engineering. BS, BS/MS
- Cybersecurity. MS
- Electrical Engineering. BS, BS/MS
- Electrical and Computer Engineering. MS, PhD
- Energy Systems. Minor
- Engineering and Business. Minor
- Engineering Science and Mechanics. MS, PhD
- Environmental Engineering. BS, MS, PhD
- Global Development. Minor
- Health Systems. MS
- Industrial Engineering. BS, MS, PhD
- Leadership Studies. Minor
- Machine Learning. PhD
- Manufacturing Leadership. PMML
- Materials Science and Engineering. Minor, BS, BS/MS, MS, PhD
- Mechanical Engineering. BS, MS, MS (undesignated), PhD
- Medical Physics. MS
- Nuclear Engineering. MS, PhD
- Nuclear and Radiological Engineering. Minor, BS
- Ocean Science and Engineering. PhD
- Operations Research. MS, PhD
- Quantitative and Computational Finance. MS
- Robotics. MS, PhD
- Statistics. MS
- Supply Chain Engineering. MS
- Sustainable Electrical Energy. PMSEE

Guggenheim School of Aerospace Engineering

The Guggenheim School of Aerospace Engineering prepares students at the bachelor's, master's, and doctoral levels for a career in vehicle engineering with primary emphasis on flight vehicles. A combined BS/MS honors program (BS/MS in Aerospace Engineering) is also offered, preparing students for graduate studies. In addition, the School offers research opportunities (Research Opportunities), a minor in aerospace engineering, and interdisciplinary minors in the fields of energy systems and scientific and engineering computing. The School is housed in five buildings with a total of approximately 122,000 square feet, most of which is devoted to instructional and research laboratories. Additional information may be found at https://aerospace.gatech.edu/undergraduate-curriculum

Minor

- Minor in Aerospace Engineering

In partnership with other units on campus, the School also offers interdisciplinary minors in the areas of energy systems, and scientific and engineering computing.

Bachelor's Degree

- Bachelor of Science in Aerospace Engineering

Master's Degrees

- Master of Science in Aerospace Engineering
- Master of Science in Computational Science and Engineering
- Master of Science in Robotics

Doctoral Degrees

- Doctor of Philosophy with a Major in Aerospace Engineering
- Doctor of Philosophy with a Major in Computational Science and Engineering
- Doctor of Philosophy with a Major in Robotics

Graduate Study in Aerospace Engineering

Graduate Programs

- Master of Science in Aerospace Engineering
- Master of Science in Computational Science and Engineering
- Master of Science in Robotics
- Master of Science in Bioengineering
- Doctor of Philosophy with a Major in Aerospace Engineering
- Doctor of Philosophy with a Major in Computational Science and Engineering

- Doctor of Philosophy with a Major in Robotics
- Doctor of Philosophy with a Major in Machine Learning
- Doctor of Philosophy with a Major in Bioengineering

Contact Information

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School of Aerospace Engineering
Georgia Institute of Technology
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Atlanta, GA 30332-0150

ae-graduate-info@aerospace.gatech.edu

Phone: 404.894.3000
Fax: 404.894.2760

Departmental Resources

- Aerospace Engineering web site
- Aerospace Engineering academic program overview

Office of Graduate Studies

- Aerospace Engineering

Rules and Regulations

The Catalog is the authoritative source of Rules and Regulations and other Policies for Georgia Tech students.

Undergraduate Study in Aerospace Engineering

Undergraduate Programs

- Minor in Aerospace Engineering
- Bachelor of Science in Aerospace Engineering

Accreditation

The BS in Aerospace Engineering program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET).

Admission

- Undergraduate Admission

Advising

- Undergraduate Advising

Departmental Resources

- Information for Currently Enrolled Undergraduate Aerospace Engineering Students
- Aerospace Engineering Combined BS/MS Honors Program

Rules and Regulations

The Catalog is the authoritative source of Rules and Regulations and other Policies for Georgia Tech students.

H. Milton Stewart School of Industrial and Systems Engineering

Industrial engineering is a branch of engineering that designs and improves systems and processes to enhance efficiency and productivity. The field uses technology to properly manage resources of all kinds, including human beings, around the world. Industrial engineering involves designing and analyzing complex systems that integrate technical, economic, and social factors for all types of organizations. The methodologies involved in industrial engineering are probability, optimization, capital investment analysis, statistics, and computer science. The important application domains are supply-chain systems, manufacturing, planning, quality control, economics, and financial systems, among others. Graduates can be found in a host of settings including transportation, telecommunications, hospitals, banking, environmental systems, retailing, government, and consulting.

Bachelor's Degree

- Bachelor of Science in Industrial Engineering

Master's Degrees

- Master of Science in Analytics
- Master of Science in Computational Science and Engineering
- Master of Science in Health Systems
- Master of Science in Industrial Engineering
- Master of Science in Operations Research
- Master of Science in Quantitative and Computational Finance
- Master of Science in Statistics
- Master of Science in Supply Chain Engineering

Doctoral Degrees

- Doctor of Philosophy with a Major in Algorithms, Combinatorics, and Optimization
- Doctor of Philosophy with a Major in Bioinformatics
- Doctor of Philosophy with a Major in Computational Science and Engineering
- Doctor of Philosophy with a Major in Industrial Engineering
- Doctor of Philosophy with a Major in Machine Learning
- Doctor of Philosophy with a Major in Operations Research

Graduate Study in Industrial & Systems Engineering

Master's Degrees

- Master of Science in Analytics
- Master of Science in Computational Science and Engineering
- Master of Science in Health Systems
- Master of Science in Industrial Engineering
- Master of Science in Operations Research
- Master of Science in Quantitative and Computational Finance
- Master of Science in Statistics
- Master of Science in Supply Chain Engineering

Doctoral Degrees

- Doctor of Philosophy with a Major in Algorithms, Combinatorics, and Optimization
- Doctor of Philosophy with a Major in Bioinformatics
- Doctor of Philosophy with a Major in Computational Science and Engineering
- Doctor of Philosophy with a Major in Industrial Engineering
- Doctor of Philosophy with a Major in Machine Learning
- Doctor of Philosophy with a Major in Operations Research

Doctoral Study in Industrial Engineering

The PhD Program in Industrial Engineering is intended for qualified individuals for whom past accomplishments and evaluation indicate a high potential for successful completion of the program requirements and a subsequent creative intellectual contribution to the field. Admitted students may pursue their work in various concentrations related to common themes associated with industrial engineering:

- supply chain logistics and manufacturing,
- economic decision analysis,
- applied statistics, and
- human-integrated systems.

Admission is dependent upon student qualification rather than educational background in any specified discipline. Consideration for admission is based largely upon performance in prior academic work, the Graduate Record Examination (GRE), and credible letters of reference.

Distance Learning

The School of Industrial and Systems Engineering offers off-campus working professionals the opportunity to enroll in many of its graduate courses through video technologies. Qualified individuals can complete the requirements for the MS IE or MS OR utilizing the video-based delivery system. Admission as a degree-seeking student in the video program is based upon the same criteria as for regular students. See Distance Learning and Professional Education for more information.

Financial Aid

Financial aid for PhD study is available in the form of traineeships, fellowships, sponsored externships, and research and teaching assistantships.

Undergraduate Study in Industrial & Systems Engineering

Bachelor's Degree

- Bachelor of Science in Industrial Engineering

Exceptional Students Options

Program activities and options are available to encourage and reward students with superior records and abilities. Participation in these programs requires demonstrated scholastic excellence and prior arrangement with the student's advisor and/or the Associate Chair for Undergraduate Studies.

Graduate-Level Courses

With approval, students with a cumulative grade-point average of 3.0 or above may take up to 9 credit hours of graduate-level courses. Students who would get both BS and MS in ISYE may use up to 6 credit hours of graduate-level course for both degrees. To take a graduate-level course for both degrees, the grade-point average must be 3.5 or higher.

Honors Courses

When faculty resources permit, the School offers honors versions of some of the required courses for the BS IE Students with a cumulative grade-point average of at least 3.3 are allowed to enroll in these courses and use them as replacements for the analogous course requirements in the curriculum.

Visiting Scholar/Practitioner Offerings

Occasionally, the School brings to campus selected individuals of unique accomplishment for course offerings built around their special areas of activity, thus making available a broader range of course materials than regularly provided. Prominent in this regard is the James C. Edenfield Executive-in-Residence program, which brings highly successful executives to the School. Participating much like visiting faculty, these executives bring to a classroom setting, both graduate and undergraduate, the benefit of their work experiences as they support the ISYE curriculum.

The Bachelor of Science in Industrial Engineering is accredited by the Engineering Accreditation Commission of ABET, www.abet.org.

Multidisciplinary Activities and Programs

The College of Engineering encourages cross-unit collaboration within the College and supports the interdisciplinary culture of Georgia Tech and the merging of disciplines that is the trait of modern technology development. Engineering faculty provide leadership for such activities through their involvement in more than thirty research centers and institutes on campus.

The College also provides opportunities for engineering students to participate in interdisciplinary activities by working with faculty in the centers as research assistants, by taking part in interdisciplinary design projects and competitions, and by completing one or more of the College's multidisciplinary certificate programs.

Any student in good academic standing who is pursuing a degree in one of the participating schools of the College of Engineering or a participating school in any of the other colleges may select elective courses and the subjects of special problems to satisfy simultaneously both the requirements of their major degree program and those of a specialized multidisciplinary program. Upon graduation, the student receives both the degree in the major field of study and a certificate attesting to successful completion of the particular related multidisciplinary program.

The following table shows available program offerings and the degree levels of the programs:

Program	Degree Level
Biomaterials	BS
Composites Engineering	BS, MS, PhD

Geohydrology	MS, Phd
Manufacturing	MS, Phd
Mechanical Properties of Materials	MS, PhD
Nanomaterials	BS
Pulp and Paper Engineering	BS
Technology & Management	BS

General Requirements of Undergraduate Multidisciplinary Programs

The specific design of the multidisciplinary program of any participating undergraduate student, while individualized, must meet certain general requirements as well as requirements that are specific to that multidisciplinary area. The general (minimum) undergraduate multidisciplinary requirements are as follows:

1. The program must relate the student's major area to the given multidisciplinary area.
2. Courses must be taken under more than one academic unit.
3. At least twelve credit hours (not required by name and number in the student's major) must be taken in a coherent program.
4. At least nine credit hours must be at the 3000 level or higher.
5. At least three credit hours must be outside the major field. (Cross-listed courses may be counted outside the student's major)
6. Courses must be taken on a letter-grade basis, and a C or better must be earned in each course counting toward a multidisciplinary certificate.

General Requirements of Graduate Multidisciplinary Programs

The specific design of the multidisciplinary program of any participating graduate student, while individualized, must meet certain general requirements as well as requirements that are specific to that multidisciplinary area. The general (minimum) graduate multidisciplinary requirements are the same as those listed previously for the undergraduate programs, with the following exceptions:

1. At least three of the coherent multidisciplinary program courses as well as nine credit hours must be at the 6000 level or higher
2. Students at the doctoral level must, on an individual basis, meet additional requirements specified by the student's doctoral committee, consistent with a program beyond the master's level that has as it's objective the development of a doctoral-level multidisciplinary program.

Interested students may obtain detailed information on the various undergraduate-level and graduate-level multidisciplinary programs from the main office of their academic advisors and from the links below.

Certificate Procedures

Petitions for multidisciplinary program certificates are processed as follows:

1. During the semester in which the student expects to graduate, the student completes a Petition for Multidisciplinary Certificate form and obtains the signature the chair of the certificate program.
2. When complete, the petition is forwarded to the Office of the Dean of Engineering.
3. At the end of the semester in which all graduation requirements have been met, the certificate will be signed by the dean of the College of Engineering and mailed to the student.

Biomaterials Certificate

Composites Engineering Certificate

Geohydrology Certificate Program

Mechanical Properties of Materials Certificate

Nanomaterials Certificate

Pulp and Paper Engineering Certificate

Technology & Management Program

School of Chemical and Biomolecular Engineering

Chemical and Biomolecular Engineering is a branch of engineering that prepares students for an enormously varied set of career paths. Graduates have become corporate executives, plant engineers, professors, inventors, lawyers, researchers, physicians, consultants, and financial officers. They have found employment with oil & gas, chemical, biomedical, pharmaceutical, microelectronics, environmental, pulp & paper, food, textile, fertilizer, fragrance, and automobile companies, as well as in academia, government, consulting and financial services companies. Chemical and biomolecular engineers have led the development of biomedicine and biotechnology, and they have been crucial to the materials revolution, especially in computer chip manufacturing, nanotechnology, and plastics and fibers. Additionally, they are essential in addressing the energy needs of the nation. Chemical and biomolecular engineering emphasizes environmentally benign manufacturing and sustainable development.

The "What do chemical engineers do?" website celebrates the many significant advancements that chemical engineers have made to our world. Explore the site to learn more about chemical engineering's contributions in many areas.

Undergraduate Program

Chemical and biomolecular engineering principles are taught as the foundation of the B.S. degree; however, students are also expected to solve all kinds of problems, to view systems in their entirety, and to formulate and test solutions irrespective of the framework of the problem. Completion of the B.S. degree prepares students for entry into the workforce or advanced study in a variety of graduate programs.

Degrees Offered:

- **B.S. in ChBE**—Standard Option: provides the basics of biomolecular engineering but allows much more flexibility for students to pursue other areas of chemical engineering, such as microelectronics, materials, and the environment. Special opportunities exist for students wishing to pursue minors or certificates in fields of particular interest, and students are encouraged to participate in faculty-directed research.
- **B.S. in ChBE**—Biotechnology Option: allows students to focus their education on the biomolecular aspects of chemical and biomolecular engineering. This option includes the core chemical engineering

courses, specialized biomolecular engineering courses, biochemistry, and technical electives focused in the biotechnology area.

- **Five-year B.S./M.S. in ChBE**: seeks to engage undergraduate students who indicate an interest in, and ability for, additional education beyond the B.S. degree. Students with significant AP credit will be especially well positioned to take advantage of this opportunity.

Both curriculum tracks offer special opportunities for students wishing to pursue minors or certificates in fields of particular interest, and students are encouraged to explore the frontiers of knowledge through involvement in faculty-directed research.

Graduate Program

The School of Chemical & Biomolecular Engineering offers graduate programs involving advanced-level coursework and independent research leading to M.S. and Ph.D. degrees in chemical engineering. The M.S. degree can usually be obtained by coursework only, without a thesis. Course selection for both the M.S. and doctoral degrees is quite flexible, with individual plans of study developed for each student.

Research opportunities exist in a broad range of areas of importance to chemical engineers and society, including catalysis, reaction kinetics, complex fluids, microelectronics, microfluidics, optimization, bioinformatics, polymers, sustainable development, pulp and paper, separations, CO_2 capture, biomedicine, solar energy, thermodynamics, MEMS, environmental science, reaction engineering, cancer diagnostics and therapeutics, biofuels, air quality, modeling, and process synthesis and control.

Furthermore, the School of Chemical and Biomolecular Engineering participates with other schools in offering M.S. and Ph.D. degrees in Bioengineering.

The Georgia Institute of Technology is accredited by the Southern Association of Colleges and Schools Commission on Colleges to award baccalaureate, masters, and doctoral degrees.

Southern Association of Colleges and Schools Commission on Colleges
1866 Southern Lane
Decatur, Georgia 30033-4097
telephone 404.679.4500

Contact http://www.sacscoc.org for questions about the accreditation of the Georgia Institute of Technology.

Georgia Tech's Cooperative Program is accredited by the Accreditation Council for Cooperative Education.

Minors

Special opportunities exist for students wishing to pursue minors or certificates in fields of particular interest, and students are encouraged to explore the frontiers of knowledge through involvement in faculty-directed research.

Visit our website at www.chbe.gatech.edu for more information.

Minor Program of Study & Guidelines

Bachelor's Degrees

- Bachelor of Science in Chemical and Biomolecular Engineering

Master's Degrees

- Bachelor of Science/Master of Science in Chemical and Biomolecular Engineering
- Master of Science in Bioengineering
- Master of Science in Chemical Engineering

Doctoral Degrees

- Doctor of Philosophy with a Major in Bioengineering
- Doctor of Philosophy with a Major in Chemical Engineering

Graduate Study in Chemical and Biomolecular Engineering

Graduate Programs

- Bachelor of Science/Master of Science in Chemical and Biomolecular Engineering
- Master of Science in Bioengineering
- Master of Science in Chemical Engineering
- Doctor of Philosophy with a Major in Bioengineering
- Doctor of Philosophy with a Major in Chemical Engineering

Contact Information

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Departmental Resources

- Chemical and Biomolecular Engineering web site
- Information for graduate students

Office of Graduate Studies

- Chemical and Biomolecular Engineering
- Chemical and Biomolecular Engineering program spotlight

Rules and Regulations

The Catalog is the authoritative source of Rules and Regulations and other Policies for Georgia Tech students.

Undergraduate Study in Chemical and Biomolecular Engineering

Chemical engineering is a discipline that traditionally has been based in the application of chemistry as an enabling science. The strength of that foundation has resulted in enormous advances in the chemical, petroleum, and related industries that have relied on chemical engineering to provide much of the intellectual capital on which they depend. Over time, and with increasing speed, the discipline has expanded so that biological sciences and chemistry now fill the position once uniquely held by chemistry. Georgia Tech's School of Chemical

& Biomolecular Engineering is a national leader in restructuring its curriculum and research initiatives to reflect that evolution.

The chemical and biomolecular engineering undergraduate curriculum leads to a Bachelor of Science in Chemical and Biomolecular Engineering. Chemical and biomolecular engineering principles are taught as the foundation of that degree but students also are expected to develop an ability to solve all kinds of problems, to view systems in their entirety, and to formulate and test solutions irrespective of the framework of the problem. Completion of the B.S. degree prepares students for entry into the workforce, for advanced study in chemical and biomolecular engineering, or for countless other graduate programs.

Program Educational Objectives

The mission of the School of Chemical & Biomolecular Engineering is to provide students with the intellectual basis to be educated citizens, to prepare them for successful professional careers, and to advance the science and technology that form the basis of chemical and biomolecular engineering. In pursuit of this mission, the School has adopted the following program educational objectives.

- Graduates will be recognized for excellence and leadership and selected for high-impact industrial, academic, government, and other professional positions
- Graduates will be intellectual leaders in solving global problems in a diverse and evolving landscape of technology, environment, and public policy
- Graduates will demonstrate critical-thinking and problem-solving abilities in developing creative, innovative, and ethical solutions to contemporary challenges using the tools of chemical and biomolecular engineering
- Graduates will engage in self-initiated, life-long learning for professional growth in their chosen career paths.

Student Outcomes

In pursuit of its educational objectives, the School has adopted the following student outcomes. Upon graduation students are expected to be able to demonstrate:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics;
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors;
3. an ability to communicate effectively with a range of audiences;
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts;
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives;
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

In pursuit of these outcomes, the curriculum is designed to provide coverage of core areas of chemical and biomolecular engineering, and to allow students opportunities to explore the breadth of the discipline. The curriculum requires a total of 132 credit hours for the B.S. degree. The biotechnology option allows the student to focus intensely in this rapidly emerging area of chemical engineering. The standard option provides the flexibility to explore other areas of chemical engineering practice while providing an understanding of the biomolecular aspects of modern chemical engineering. The standard program will also allow chemical and biomolecular engineering students to tailor their educations to their particular interests and plans for their professional careers. Students are encouraged to use the required elective hours to earn a minor or certificate, or at least to focus their electives in an area of particular interest.

Many graduates have found international experience obtained as a student to be valuable later in their careers. The School is developing special initiatives to facilitate such experiences, and it has a longstanding five-week summer program at Imperial College London in which students receive six credit hours of elective credit and credit for CHBE 4200.

Finally, although the focus of the curriculum is development of technical skills, it has elements geared to enhance communication, teamwork, and business skills.

Minors and Certificates

Special opportunities exist for students wishing to pursue minors or certificates in fields of particular interest. The School of Chemical and Biomolecular Engineering participates in the interdisciplinary Energy Systems minor and offers a Pulp & Paper certificate.

General information regarding minors at Georgia Tech can be found here: Minor Program of Study & Guidelines.

Bachelor's Degrees

- Bachelor of Science in Chemical and Biomolecular Engineering

Transfer Students

Due to the sequence of courses and the order in which they must be taken, students who transfer into the school of Chemical and Biomolecular Engineering (ChBE) from another university should expect to be enrolled for a minimum of six semesters (Fall, Spring, Summer). If, for financial aid purposes, insurance, etc., students are required to be full-time, they should transfer to Georgia Tech having sufficient non-chemical and biomolecular engineering courses remaining to enroll full-time for six terms. All prerequisites and co-requisites must be followed.

The B.S. in Chemical and Biomolecular Engineering degree program is accredited by the Engineering Accreditation Commission of ABET, www.abet.org.

School of Civil and Environmental Engineering

The School of Civil and Environmental Engineering offers courses in civil engineering, environmental engineering, and engineering science and mechanics, as well as programs leading to the following degrees:

- Bachelor of Science in Civil Engineering,
- Bachelor of Science in Environmental Engineering,

- Master of Science in Civil Engineering,
- Master of Science in Engineering Science and Mechanics,
- Master of Science in Environmental Engineering, and
- Doctor of Philosophy.

The School participates in the interdisciplinary graduate programs in Bioengineering, Computational Science & Engineering, and Ocean Science and Engineering. The School also offers a dual program leading to the following degrees:

- Master of Science in Civil Engineering, with a concentration in transportation systems engineering, and
- Master of City and Regional Planning.

Minors

- Minor in Leadership Studies: Global Engineering
- Minor in Energy Systems: Civil & Environmental Engineering

Bachelor's Degrees

- Bachelor of Science in Civil Engineering
- Bachelor of Science in Environmental Engineering

Master's Degrees

- Master of Science in Bioengineering
- Master of Science in Civil Engineering
- Master of Science in Computational Science and Engineering
- Master of Science in Engineering Science and Mechanics
- Master of Science in Environmental Engineering
- Dual Degree - Master of City and Regional Planning/Master of Science in Civil Engineering

Doctoral Degrees

- Doctor of Philosophy with a Major in Bioengineering
- Doctor of Philosophy with a Major in Civil Engineering
- Doctor of Philosophy with a Major in Computational Science and Engineering
- Doctor of Philosophy with a Major in Engineering Science and Mechanics
- Doctor of Philosophy with a Major in Environmental Engineering
- Doctor of Philosophy with a Major in Ocean Science & Engineering

Graduate Study in Civil and Environmental Engineering

Graduate Programs

- Master of Science in Bioengineering
- Master of Science in Civil Engineering
- Master of Science in Computational Science and Engineering
- Master of Science in Engineering Science and Mechanics
- Master of Science in Environmental Engineering
- Dual Degree - Master of City and Regional Planning/Master of Science in Civil Engineering
- Doctor of Philosophy with a Major in Bioengineering
- Doctor of Philosophy with a Major in Civil Engineering
- Doctor of Philosophy with a Major in Computational Science and Engineering
- Doctor of Philosophy with a Major in Engineering Science and Mechanics
- Doctor of Philosophy with a Major in Environmental Engineering
- Doctor of Philosophy with a Major in Ocean Science & Engineering

Graduate Certificate in Remote Sensing

Students completing the master's or doctoral degree requirements of the School may earn a Graduate Certificate in Remote Sensing.

- Graduate Certificate in Remote Sensing

Undergraduate Study in Civil and Environmental Engineering

Minor

- Minor in Leadership Studies

Bachelor's Degrees

- Bachelor of Science in Civil Engineering
- Bachelor of Science in Environmental Engineering

The following undergraduate engineering programs are accredited by the Engineering Accreditation Commission of ABET, www.abet.org.

- Bachelor of Science in Civil Engineering
- Bachelor of Science in Environmental Engineering

School of Electrical and Computer Engineering

Electrical engineers have defined, shaped, and driven the information technology revolution that we are experiencing today. Building on the fundamental cornerstones of electrical engineering—the control of information and electric power—electrical engineers have been responsible for innovations and technological breakthroughs that have altered the fabric and face of modern life. Cell phones, tablets, modern hearing aids, the Internet, digital cameras, global positioning systems, and hybrid cars all are based on electrical engineering. Georgia Tech's School of Electrical and Computer Engineering (ECE) is consistently ranked nationally among the top ten of all electrical engineering programs, and its graduates are pioneering such life-altering innovations as biomedical devices that save lives, and improve everyday living for disabled people, as well as environmentally friendly technologies such as solar energy and wind power. The electrical engineering program encompasses all major areas of this dynamic field, including analog electronics, bioengineering, digital signal processing, electric power, electromagnetics, microelectronics and microsystems, nanosystems, optics and photonics, systems and controls, and telecommunications.

Combining the study of computer systems with traditional aspects of electrical engineering, computer engineering is one of the fastest growing fields in the country, with projected demand over the next decade expected to grow by as much as 150 percent. The computer engineering program in ECE is at the forefront of this new and dynamic field, with national rankings consistently in the top ten. Rapid advances in underlying technologies have resulted in ever smaller, less costly, and higher-performance computer systems, making computers omnipresent

in our everyday lives and fueling exciting developments in areas like robotics, wired and wireless networking, embedded processing, network security, and data storage. It is this ever-expanding capacity of computers that empowers us to communicate, learn, transact business, receive medical treatment, and explore space in new ways.

The School of Electrical and Computer Engineering (ECE) provides undergraduate and graduate programs that prepare students to participate in a broad range of career opportunities. Modern facilities and laboratories support experimental and theoretical programs of instruction and research. Additional information about the School is available at https://ece.gatech.edu/ or upon request by calling 404.894.2901.

Bachelor's Degrees

- Bachelor of Science in Computer Engineering
- Bachelor of Science in Electrical Engineering

Master's Degrees

- Bachelor of Science/Master of Science in Electrical and Computer Engineering
- Dual MS Program in ECE GT Lorraine and European Partner Universities
- Dual MS Program in ECE GT and Korean Advanced Institute of Science and Technology
- Dual MS Program in ECE with the Politechnico di Torino (Italy)
- Master of Science in Bioengineering
- Master of Science in Computational and Science Engineering
- Master of Science in Electrical and Computer Engineering
- Master of Science in Robotics
- Professional Master's in Sustainable Electrical Energy (PMSEE)

Doctoral Degrees

- Doctor of Philosophy with a Major in Bioengineering
- Doctor of Philosophy with Major in Computational Science and Engineering
- Doctor of Philosophy with a Major in Electrical and Computer Engineering
- Doctor of Philosophy with a Major in Machine Learning
- Doctor of Philosophy with a Major in Robotics
- Joint Doctor of Philosophy with a Major in Electrical and Computer Engineering with the Politechnico di Milano
- Joint Doctor of Philosophy with a Major in Electrical and Computer Engineering with the Politechnico di Torino (Italy)

Graduate Study in Electrical and Computer Engineering

Master's Degrees

- Bachelor of Science/Master of Science in Electrical and Computer Engineering
- Dual MS Program in ECE GT Lorraine and European Partner Universities
- Dual MS Program in ECE GT and Korean Advanced Institute of Science and Technology
- Dual MS Program in ECE with the Politechnico di Torino (Italy)
- Master of Science in Bioengineering
- Master of Science in Electrical and Computer Engineering
- Master of Science in Robotics
- Professional Master's in Sustainable Electrical Energy (PMSEE)

Doctoral Degrees

- Doctor of Philosophy with a Major in Bioengineering
- Doctor of Philosophy with a Major in Electrical and Computer Engineering
- Doctor of Philosophy with a Major in Machine Learning
- Doctor of Philosophy with a Major in Robotics

Certificate Program in Remote Sensing GT-Lorraine

Students may choose to pursue graduate degrees in Electrical and Computer Engineering at Georgia Tech-Lorraine, the European campus of the Georgia Institute of Technology, located in Metz, France. Undergraduate programs are also offered in the fall, spring, and summer terms at Georgia Tech-Lorraine. In addition to courses taught in English by regular Georgia Tech faculty, students also may participate in courses and academic programs offered by partner French universities.

Georgia Tech-Lorraine

ECE Website

GT-Shenzhen

Students may choose to pursue a Master's degree in Electrical and Computer Engineering at Georgia Tech-Shenzhen, an instructional site of the Georgia Institute of Technology, located in Shenzhen, China. Courses are taught in English by regular Georgia Tech faculty during the fall, spring, and summer terms at Georgia Tech-Shenzhen.

gtshenzhen@ece.gatech.edu
Georgia Tech-Shenzhen: www.shenzhen.gatech.edu
ECE Website: www.ece.gatech.edu

Undergraduate Study in Electrical and Computer Engineering

Bachelor's Degrees

- Bachelor of Science in Computer Engineering
- Bachelor of Science in Electrical Engineering

The following undergraduate engineering programs are accredited by the Engineering Accreditation Commission of ABET, www.abet.org.

- Bachelor of Science in Computer Engineering
- Bachelor of Science in Electrical Engineering

School of Materials Science and Engineering

Established in 1985
(School of Textile Engineering established in 1897)
(School of Ceramic Engineering established in 1924)

General Information

The School of Materials Science and Engineering provides high-quality academic programs focused on developing a fundamental understanding of all forms of materials and the creation of new materials in different environments for the next generation of engineering applications and functions. A discipline on the forefront of innovations in both science and engineering, the BSMSE degree offers students three separate concentrations:

- Polymer and Fiber materials;
- Structural and Functional materials, and
- Biomaterials.

The BSMSE degree involves studies of engineering materials, such as metals, ceramics, polymers, fibers, textiles, composites, biomaterials, nanomaterials and electronic materials, from a fundamental point of view, emphasizing the relationships between the atomic- and micro-scale structure, with the processing, properties, and performance of the materials.

Completion of the BS degree prepares students for entry into the workforce in diverse technology sectors, or for advanced study in materials science and engineering, or for other graduate programs. Materials scientists and engineers have many career options available, such as in aerospace, automotive, biomedical, chemical, defense, electronics, materials processing, textiles, consumer products, and recreational and sporting equipment industries, as well as in universities, government, and industrial laboratories, and even in consulting, legal, business, and medical disciplines

Academic instruction and research in the School of Materials Science and Engineering at Georgia Tech spans the following areas:

1. Synthesis and processing focusing on development of advanced and traditional materials with novel compositions and tailored microstructures;
2. Characterization and evaluation of structure and properties using advanced techniques and state-of-the-art instrumentation; and
3. Computational modeling of processing-structure-property-performance relationships emphasizing correlation of properties with the structure across nano-, micro-, meso-, and macro-length scales.
4. Design of materials through fundamental theoretical and experimental understanding of materials behavior to address societal challenges in energy, infrastructure, environment, security, health and welfare, and transportation.

MSE faculty participate in collaborative research projects with faculty from other schools in the Colleges of Engineering and Sciences, and the Georgia Tech Research Institute. Several interdisciplinary centers are led by MSE faculty. The external sponsored research funding brought in by the FTE faculty in the School of Materials Science and Engineering exceeds $15 million per year and comes from a wide variety of sources including industry, private foundations, and federal agencies including AFOSR, ARO, DARPA, DoE, DTRA, NSF, NIH, and ONR. A significant number of materials specialists are required to meet the present and future opportunities and challenges of this field, which makes MSE graduates sought after in practically every aspect of technological advancement.

The school offers a Bachelor of Science in Materials Science and Engineering degree. An undergraduate minor in materials science and engineering is available for non-MSE majors. Graduate degrees (MS and PhD) are offered in materials science and engineering, paper science and engineering, and in the interdisciplinary bioengineering program. Certificate programs are also available in biomaterials, composite materials, nanomaterials, and computational materials science and engineering.

Minor

- Minor in Material Science and Engineering

Bachelor's Degree

- Bachelor of Science in Materials Science and Engineering

Master's Degrees

- Bachelor of Science/Master of Science in Materials Science and Engineering
- Master of Science in Bioengineering
- Master of Science in Computational Science and Engineering
- Master of Science in Materials Science and Engineering

Doctoral Degrees

- Doctor of Philosophy with a Major in Bioengineering
- Doctor of Philosophy with a Major in Computational Science and Engineering
- Doctor of Philosophy with a Major in Materials Science and Engineering

Graduate Study in Materials Science and Engineering

Materials graduates are essential to the economic growth of the country. They contribute to the development, selection, and use of materials in all engineering and scientific applications. Master's and doctoral degrees in materials science and engineering are offered. An excellent selection of undergraduate courses is also offered in preparation and support of graduate studies. Course offerings and research activities cover a diversity of subjects in the broad field of materials. Subjects include biomaterials, nanotechnology, computational materials science, physical metallurgy, mechanical properties, fracture mechanics, corrosion phenomena, processing, thermodynamics and phase equilibria, non-destructive testing, X-ray analysis, phase transformations, glass science, electronic/technical ceramics, thin-film semiconductors, electronic and optical microscopy, dispersions and rheology, refractories, surface analysis, fiber science, polymerization reaction engineering, polymer process simulation, mechanical properties of polymers, and process-structure-property characterization of polymers. State-of-the-art research facilities in the School of Materials Science and Engineering contribute to the strength of both the academic and research programs.

MSE graduates find employment with manufacturing firms in light and heavy industry, in research laboratories of private firms and federal agencies, and in academic institutions. Several recent graduates have filled positions of high responsibility in these areas and have been instrumental in advancing the level of materials engineering practice in the United States. The MSE faculty participate in numerous multidisciplinary programs including manufacturing engineering, surface science technology, microelectronics, electronic packaging, and composites.

The Master's Degree

MSE offers graduate work leading to the degrees of Master of Science in Materials Science and Engineering, Master of Science in Paper Science and Engineering, and Master of Science with a major in Materials Science and Engineering. The student admitted for graduate work will normally have completed an undergraduate program in materials, ceramics, metallurgy, or polymers. However, students with undergraduate degrees or backgrounds in other fields (e.g., physics, chemistry, geology, and chemical, mechanical, nuclear, or geological engineering) may qualify by taking certain minimum prerequisites during the early part of their graduate studies. To assure a smooth transition into the graduate program, the student should select appropriate electives during his or her undergraduate studies.

Students in the MS program must complete a core of graduate materials courses and prepare an individualized program of study for this degree in consultation with their graduate advisors. The proposed program must receive the approval of the graduate coordinator and the School chair. Thesis, non-thesis, and industrial internship options are available. The minimum credit hour requirements for the MS degree with include eighteen credit hours of courses and a minimum of twelve credit hours of thesis research, with a total minimum of 30 credit hours, or 30 credit hours of courses, or twenty-five hours of courses and six hours of project work conducted as part of an industrial internship. A total of twelve course hours must be in the major, and twelve course hours must be at the 6000 level or higher. A minimum GPA of 2.7 is required for graduation.

The Doctoral Degree

The Doctor of Philosophy degree is directed to attain proficiency in the pursuit of independent scholarly work. The degree comprises coursework in the general principles of materials, with emphasis on metallurgy, polymers, ceramics, paper science and engineering, or electronic materials. Additional requirements include specialized core courses and elective courses both in the area of the doctoral thesis and in one or two other areas, passing comprehensive examinations, and an independent research investigation.

Candidates for the doctoral degree are required to complete at least sixteen credit hours of graduate-level coursework beyond the MS degree, with a minimum GPA of 3.0, and pass the PhD qualification examination. Each student must also earn 9 credit hours in a coherent minor field, chosen in consultation with the advisor, to satisfy the School of Material Science and Engineering's core course requirements. Students should commence participation in the School's research programs early in their graduate careers.

Financial Aid

A number of fellowships and research assistantships from outside sources and industry are available to provide financial assistance for qualified graduate students. In addition, a limited number of presidential fellowships, as well as research assistantships, are available from the Institute. Further information can be obtained by contacting the director of graduate programs in the School of Materials Science and Engineering.

Mechanical Properties Research Laboratory

The Mechanical Properties Research Laboratory (MPRL) is an interdisciplinary College of Engineering laboratory that supports education and research with emphasis on structural materials. Its principal activities are directed toward the measurement and modeling of the mechanical properties of engineering materials, primarily related to deformation, fatigue, and fracture. The MPRL has an international reputation for excellence in areas of:

- fatigue and fracture studies of structural materials, structures and joints
- development of constitutive equations for deformation and damage, incorporating these advances into life prediction methodologies
- characterization and quantitative analysis of microstructure and damage in engineering materials such as structural alloys, composites, metal foams, biomaterials and nanostructured materials and alloys
- development of improved constitutive models for material deformation, fatigue and fracture behaviors
- multiscale simulation of materials and microstructure-sensitive fatigue and fraction approaches
- durability and degradation of aging materials and structures

Master's Degrees

- Bachelor of Science/Master of Science in Materials Science and Engineering
- Master of Science in Bioengineering
- Master of Science in Materials Science and Engineering

Doctoral Degrees

- Doctor of Philosophy with a Major in Bioengineering
- Doctor of Philosophy with a Major in Materials Science and Engineering

Undergraduate Study in Materials Science and Engineering

Minor

- Minor in Material Science and Engineering

Bachelor's Degree

- Bachelor of Science in Materials Science and Engineering

The BS in Materials Science and Engineering program is accredited by the Engineering Accreditation Commission of ABET, www.abet.org.

Certificate in Biomaterials

The School of Materials Science and Engineering offers certificates in biomaterials (jointly with BME), polymers, composites, and nanomaterials. Students may fulfill the certificate requirements by taking twelve credit hours[1] of approved courses. By appropriate choice of technical and free electives, only one course outside of those required for the BS MSE degree is required for any certificate and up to 3 hours of related undergraduate research credit may be applied towards a certificate. Contact the Associate Chair for Undergraduate Programs or visit http://www.mse.gatech.edu/undergraduate/certificates for eligibility requirements and a updated list of approved courses.

[1] BIOL 1510 is required for the Biomaterials certificate. Since this is a four-credit hour course, thirteen hours are often taken by MSE students who obtain this certificate.

Transfer Programs in the College of Engineering

To encourage and accommodate students who desire to study engineering but may prefer to attend a community college, a Historically Black College and University (HBCU), or a gender specific college, the College of Engineering offers the opportunity to transfer to Georgia Tech via the Dual Degree Engineering Program (DDEP) or the Regents' Engineering Pathway Program (REPP).

For further information concerning these programs, please access the following sections of the College of Engineering website:

Dual Degree Engineering Program (DDEP)
Regents' Engineering Pathway Program (REPP)

Wallace H. Coulter Department of Biomedical Engineering at Georgia Tech and Emory University

Established in 1997

Biomedical engineering is a highly interdisciplinary field integrating engineering and the life sciences to support the prevention, diagnosis, and treatment of disease. The role of the biomedical engineer is to provide answers to problems arising from the study of living systems by employing the methodology and principles of engineering. Biomedical engineers often serve as integrators in multidisciplinary teams of engineers, scientists, and healthcare professionals in the medical device and biotechnology industries as well as government regulatory agencies. Our program challenges students with practical, hands-on problem-solving and design experiences throughout the curriculum. Graduates of our program have obtained the strong foundation necessary to address the complex healthcare challenges of the twenty-first century.

The Wallace H. Coulter Department of Biomedical Engineering at Georgia Tech and Emory University (the Coulter Department) is a unique partnership between a public institution and a private university—Georgia Tech's College of Engineering and Emory's School of Medicine. The formation of the Department in 1997 was the culmination of collaborative efforts in the field of biomedical engineering that dates back to the 1980s. In 2000, the Department assumed the name of Wallace H. Coulter, who was recognized as one of the most influential engineers in the twentieth century through his entrepreneurial efforts in shaping the fields of automated cell analysis and hematology.

Research in the Coulter Department encompasses long-range fundamental research and direct clinical applications through translational research. The department has identified nine thrust areas in which to focus research and educational programs:

- biomaterials and regenerative medicine,
- biomedical imaging and instrumentation,
- biomedical informatics and systems modeling,
- biomedical robotics,
- cancer technologies,
- cardiovascular engineering,
- engineering education,
- immunoengineering, and
- neuroengineering.

Research initiatives in these areas are resulting in major breakthroughs in medicine, basic science, and applied technology.

The Coulter Department offers both undergraduate and graduate degree programs that attract outstanding students who wish to have an education that prepares them to be the leaders in this field in the twenty-first century. Additionally, to meet the needs of a rapidly changing society and global economy, the Coulter Department has forged a new partnership with Peking University to offer a joint doctoral degree in biomedical engineering. The program offers a unique means for U.S. and Chinese students who want to learn and work in a global economy and in global health settings.

Minor

- Minor in Biomedical Engineering

Bachelor's Degree

- Bachelor of Science in Biomedical Engineering

Master's Degree

- Master of Biomedical Innovation and Development
- Master of Science in Robotics
- Master of Biomedical Engineering (MS BMED) Program

Doctoral Degree

- Doctor of Philosophy with a Major in Bioengineering
- Doctor of Philosophy with a Major in Bioinformatics
- Doctor of Philosophy with a Major in Biomedical Engineering
- Doctor of Philosophy with a Major in Computational Science and Engineering
- Doctor of Philosophy with a Major in Machine Learning
- Doctor of Philosophy with a Major in Robotics
- M.D./Ph.D. Program

Graduate Study in Biomedical Engineering

Graduate Programs

- Master of Science in Biomedical Engineering
- Master of Science in Biomedical Innovation and Development
- Master of Science in Robotics
- Doctor of Philosophy with a Major in Bioengineering
- Doctor of Philosophy with a Major in Bioinformatics
- Doctor of Philosophy with a Major in Biomedical Engineering
- Doctor of Philosophy with a Major in Computational Science and Engineering
- Doctor of Philosophy with a Major in Machine Learning
- Doctor of Philosophy with a Major in Robotics
- M.D./Ph.D. Program

Contact Information

Department of Biomedical Engineering

Graduate Admissions Committee
Georgia Institute of Technology
313 Ferst Dr.
Atlanta, GA 30332-0535

Phone: 404.385.2557
Fax: 404.894.4243

Departmental Resources

- Biomedical Engineering web site

Office of Graduate Studies

- Biomedical Innovation and Development
- Bioengineering
- Bioinformatics
- Biomedical Engineering
- Computational Science and Engineering
- Robotics

Rules and Regulations

The Catalog is the authoritative source of Rules and Regulations and other Policies for Georgia Tech students.

Undergraduate Study in Biomedical Engineering

The BS in Biomedical Engineering program is accredited by the Engineering Accreditation Commission of ABET, www.abet.org.

The Department of Biomedical Engineering participates in an undergraduate Multidisciplinary Certificate in "Biomaterials".

See http://www.mse.gatech.edu/undergraduate-program/bio-cert for more details.

Woodruff School of Mechanical Engineering

Established in 1885

Mechanical Engineering (ME) was the first academic program established at Georgia Tech. On September 20, 1985, the School of Mechanical Engineering celebrated its centennial by assuming the name of one of its most distinguished alumni, Atlanta businessman and philanthropist George W. Woodruff (Class of 1917).

Today, the Woodruff School offers undergraduate degrees in mechanical engineering and nuclear and radiological engineering, and graduate degrees in mechanical engineering, nuclear and radiological engineering, medical physics, bioengineering, robotics, paper science and engineering.

Mechanical engineering embraces the generation, conversion, transmission, and utilization of thermal and mechanical energy; the design and production of tools and machines and their products; the consideration of fundamental characteristics of materials as applied to design; and the synthesis and analysis of mechanical, thermal, and fluid systems, including the automation of such systems.

Design, production, manufacture, operation, administration, economics, and research are functional aspects of mechanical engineering.

The undergraduate program in ME allows 15 credit hours of free electives, thereby allowing students to elect one of six concentration areas within in ME or any of the Institute's approved minors.

ME concentrations include:

- Automation and Robotics
- Thermal, Fluid, and Energy Systems
- Micro and Nano Engineering
- Mechanics of Materials
- Manufacturing
- Nuclear Energy

The Nuclear & Radiological Engineering (NRE) and Medical Physics (MP) programs are within the George W. Woodruff School of Mechanical Engineering. NRE and MP are based on a symbiotic group of related areas of knowledge of a common set of science, engineering, and mathematical disciplines and their applications to the development of nuclear power and the utilization of radiation in industry and medicine.

Nuclear engineering field is broad with a unique nuclear core that includes physics of neutron chain (fission) and fusion reactors, radiation production, transport, and interaction with matter, radiation damage of materials, nuclear fuel and structural materials, large-scale numerical modeling, and simulation of nuclear systems. Radiological engineering is the application of the radiation related disciplines to radiation safety (protection), medical application (medical physics), security and detection of nuclear material. The multidisciplinary aspects of nuclear engineering includes topics in

- ChBE (separation/processing),
- ECE (electronics, instrumentation, electromagnetics),
- ME (heat transfer, fluids, thermodynamics),
- MSE (mechanics and properties of material), and
- physics (nuclear, atomic, and radiation).

Medical physics encompasses the therapeutic and diagnostic applications of radiation in medicine. It involves the application of physical principles to medicine, particularly in the diagnosis and treatment of human diseases. Medical physics includes diagnostic radiology, the diagnosis of disease with X-rays, ultrasound, and magnetic resonance imaging; health physics, the study of radiation hazards and radiation protection; nuclear medicine, the diagnosis and treatment of diseases with injected radio-pharmaceuticals; and radiation oncology, the treatment of cancer by ionizing radiation.

School Facilities

The Woodruff School is housed in a multi-building classroom/research complex. Included in this complex are modern classrooms and seminar conference rooms that serve the entire Institute.

The School has many types of specialized instruments and other equipment associated with its laboratories in mechanical engineering for the study of acoustics and dynamics; automation and mechatronics; bioengineering; computer-aided engineering and design; fluid mechanics; heat transfer, combustion, and energy systems; manufacturing; mechanics of materials; micro and nano engineering; and tribology. The Nuclear and Radiological Engineering Program has special facilities for

the study of computational reactor physics; fast reactors; fusion; medical physics; and radiation detection.

Modern facilities and laboratories support experimental and theoretical programs of instruction and research. Special facilities in the Woodruff School include:

- Automation and Robotics
- Thermal, Fluid, and Energy Systems
- Micro and Nano Engineering
- Mechanics of Materials
- Manufacturing
- Nuclear Energy

The Georgia Tech Invention Studio is also housed in the Woodruff School. It is a design-build-play space open to all Georgia Tech students, faculty, and staff, regardless of year, major, or prior experience. It is staffed by the University Lab Instructors, student volunteers who are always on hand to provide machine training and help with projects.

The facilities available for the nuclear and radiological engineering and medical physics programs include the

- Radiological Science and Engineering Laboratory (RSEL),
- AREVAL Radiation Detection Laboratory,
- Varian Computational Treatment Planning Laboratory,
- Microchannel Test Facility, and
- Plasma-facing Components Thermal-hydraulic Test Facility.

The RSEL houses the Variant Clinical Accelerator (VCLA) Laboratory, Southern Nuclear Radiation Physics Laboratory which houses a graphite subcritical assembly, a neutron reference field laboratory, a thermoluminscent detector laboratory, a radiation sources laboratory housing various radioisotopes generating neutrons and photons, a nuclear materials laboratory, and a vault which houses a neutron generator.

Minors

- Minor in Energy Systems
- Minor in Engineering and Business
- Minor in Global Development
- Minor in Nuclear and Radiological Engineering

Bachelor's Degrees

- Bachelor of Science in Mechanical Engineering
- Bachelor of Science in Nuclear and Radiological Engineering

Master's Degrees

- Master of Science in Bioengineering
- Master of Science in Mechanical Engineering
- Master of Science in Mechanical Engineering (undesignated)
- Master of Science in Medical Physics
- Master of Science in Nuclear Engineering
- Master of Science in Robotics
- Master of Science - Undesignated

Doctoral Degrees

- Doctor of Philosophy with a Major in Bioengineering
- Doctor of Philosophy with a Major in Mechanical Engineering
- Doctor of Philosophy with a Major in Nuclear Engineering
- Doctor of Philosophy with a Major in Robotics

Graduate Study in Mechanical Engineering

The graduate program in mechanical engineering offers advanced study and research in the areas of acoustics and dynamics; automation and mechatronics; bioengineering; computer-aided engineering and design; fluid mechanics; heat transfer, combustion, and energy systems; manufacturing; mechanics of materials; microelectromechanical systems; and tribology. The graduate programs lead to the degrees of

- Master of Science in Mechanical Engineering,
- Master of Science,
- Master of Science in Bioengineering,
- Master of Science in Paper Science and Engineering, and
- Doctor of Philosophy for qualified graduates having backgrounds in engineering, mechanics, mathematics, the physical sciences, or the biological sciences.

The master's degree requires a minimum of thirty approved credit hours. Students may elect to earn nine of these hours by writing a thesis, or they may earn all credit toward the degree through coursework. Six hours of credit for graduate courses taken as an undergraduate at Georgia Tech and used for credit toward the BS ME may be included in the MS program of study if the student graduated with an undergraduate grade-point average of at least 3.5. Students must earn a graduate grade-point average of at least 3.0 and satisfy all remaining requirements to be certified for the master's degree.

Candidates for the Doctor of Philosophy degree must earn a graduate grade-point average of at least 3.3. Students may obtain additional information about the programs by viewing the Woodruff School Handbook for Graduate Students. Every student enrolled must consult this source of information with respect to special rules and degree requirements.

The graduate program in nuclear and radiological engineering/medical physics leads to the degrees of

- Master of Science in Nuclear Engineering,
- Master of Science in Medical Physics,
- Master of Science, and
- Doctor of Philosophy.

In nuclear and radiological engineering, students with a bachelor's degree in engineering pursue the Master of Science in Nuclear Engineering degree, while students with a Bachelor of Science degree in other fields enroll for the Master of Science degree. Depending on the career objectives of the student, the Woodruff School may encourage a thesis as part of the Master of Science program. Nuclear and radiological engineering students must earn a graduate grade-point average of at least 3.0 and satisfy all remaining requirements to be certified for the master's degree.

The doctoral program is designed with great latitude to capitalize on variations in experience and interests of individual students. Candidates

for the Doctor of Philosophy degree must earn a graduate grade-point average of at least 3.3.

Master's Degrees

- Master of Science in Bioengineering
- Master of Science in Mechanical Engineering
- Master of Science in Medical Physics
- Master of Science in Nuclear Engineering
- Master of Science in Robotics
- Master of Science - Undesignated

Doctoral Degrees

- Doctor of Philosophy with a Major in Bioengineering
- Doctor of Philosophy with a Major in Mechanical Engineering
- Doctor of Philosophy with a Major in Nuclear Engineering
- Doctor of Philosophy with a Major in Nuclear Engineering - Medical Physics Option
- Doctor of Philosophy with a Major in Nuclear Engineering - Nuclear Enterprise Management Option
- Doctor of Philosophy with a Major in Robotics

Educational Objectives

The educational objectives of the doctoral programs in the Woodruff School are:

- to prepare students for successful careers in industry and/or academia and to promote and instill an ethic for lifelong learning;
- to educate students in methods of advanced analysis, including the mathematical, computational, and experimental skills appropriate for professionals to use when solving problems;
- to provide a substantial depth of knowledge in a particular field or subfield of study that allows the student to be recognized as an expert;
- to provide a breadth of knowledge in a minor field of study that fosters an awareness of and skill in interdisciplinary approaches to problem solving;
- to develop the skills pertinent to the research process, including the students' ability to formulate problems, to synthesize and integrate information, to work collaboratively, to communicate effectively, and to publish the results of their research; and
- to promote a sense of scholarship, leadership, and service among our graduates.

The educational objectives of the master's degree programs in the Woodruff School are:

- to prepare students for successful careers in industry and to promote and instill an ethic for lifelong learning;
- to educate students in methods of advanced analysis appropriate for professionals to use when solving problems;
- to provide a depth of knowledge in a particular field of study that allows the student to apply innovative techniques to solve problems;
- to provide a breadth of knowledge that fosters an awareness of and skill in interdisciplinary approaches to problem solving; and
- to develop the skills pertinent to the research process, including the students' ability to formulate problems, to synthesize and integrate information, to work collaboratively, to communicate effectively, and to publish the results of their research (MS thesis students).

The M.S. in Medical Physics and the Ph.D. in Nuclear and Radiological Engineering-Medical Physics Option programs are accredited by the Commission on Accreditation of Medical Physics Educational Programs, CAMPEP, www.campep.org/campeplstgrad.asp.

Distance Learning Programs

The Woodruff School offers working professionals the opportunity to enroll in many of its graduate courses through video, CD-ROM, or Internet technologies. The distance-learning program has the same admission, course, and degree requirements as those for graduate students attending classes at the Atlanta campus or at Georgia Tech-Lorraine. Qualified individuals may complete the requirements for the master's degrees in mechanical engineering (MS ME) and medical physics (MS MP) by utilizing the distance-learning mode.

Distance Learning & Professional Education

Georgia Tech-Lorraine

The Woodruff School's program at Georgia Tech-Lorraine in Metz, France has a number of components. In addition to the master's of science degree in mechanical engineering (MS ME) there is also a doctoral program, which has grown as a result of major funding from CNRS and Georgia Tech; a new fall/spring semester undergraduate program; and the undergraduate summer program. Most graduate students focus on the MS ME French students from partner institutions, such as ENSAM and the Ecole des Mines, take courses at Georgia Tech-Lorraine, typically for two semesters, before coming to the Atlanta campus to finish their master's degree. U.S. students take classes at GTL as well as at ENSAM for three semesters and receive both the MS ME and the Master Professionel of ENSAM. Students must also complete an internship in France during the summer. The mechanical engineering programs offered at GTL have the same admission, course, and degree requirements as those for graduate students in mechanical engineering attending classes on the Atlanta campus or through the distance-learning program. ENSAM is a leading institution for the study of mechanical and industrial engineering with eight campuses across France, including one in Metz. For more information on the Georgia Tech-Lorraine program, view www.georgiatech-metz.fr.

Multidisciplinary Programs

Mechanical engineering students may plan electives that satisfy simultaneously the requirements of the degree program and a designated multidisciplinary field within the College of Engineering, thus earning both a graduate degree and a certificate indicating expertise in a related specialty. For a complete description of these and other multidisciplinary programs, contact the School.

Undergraduate Study in Mechanical Engineering

Minors

- Minor in Energy Systems
- Minor in Engineering and Business

- Minor in Global Development
- Minor in Nuclear and Radiological Engineering

Bachelor's Degrees

- Bachelor of Science in Mechanical Engineering
- Bachelor of Science in Nuclear and Radiological Engineering

Undergraduate Research

Georgia Tech encourages undergraduate students to participate in quality and substantive research. There are several options in the Woodruff School for both mechanical engineering and nuclear and radiological engineering majors to do special problem courses or undergraduate research courses. Students can do a non-research special problem course. This is usually a design course and it might be combined with the capstone design class for a two-semester design problem. There are two types of undergraduate research courses; an ME or NRE class; and research internships, where students are paid for working on a project either part time or full time. For both options, the course appears on the transcript. In all cases, the student must find a faculty member to work with. Each special problem and research course requires a written final report, which is to be submitted to the faculty advisor for grading. All special problems courses taken for credit receive a letter grade and appear on the transcript. Funding opportunities are available through the President's Undergraduate Research Awards.

For more information on undergraduate research at Georgia Tech, visit www.undergradresearch.gatech.edu and for specific ME/NRE program information, visit www.me.gatech.edu.

The following undergraduate engineering programs are accredited by the Engineering Accreditation Commission of ABET, www.abet.org.

- Bachelor of Science in Mechanical Engineering
- Bachelor of Science in Nuclear and Radiological Engineering

College of Sciences

College established in 1990
First Science Program in 1888

The College of Sciences comprises six schools

- Biological Sciences,
- Chemistry and Biochemistry,
- Earth and Atmospheric Sciences,
- Mathematics,
- Physics, and
- Psychology.

All schools offer BS, MS, and PhD degree programs.

In addition, the College of Sciences offers a BS program in Neuroscience.

The Center for Education Integrating Science, Mathematics, and Computing (CEISMC), which works with K-12 schools and teachers in the state of Georgia to improve science and mathematics education, is also a unit of the College of Sciences.

The College of Sciences provides the courses in mathematics and the natural sciences that are necessary for all Tech undergraduates to acquire skills and basic principles for their majors. A detailed description of each degree program in the College of Sciences is located under the appropriate school heading, as are descriptions of the courses offered. The College of Sciences' courses required or recommended by degree programs in the other five colleges at Georgia Tech are listed under the curricula for those degrees.

The American Chemical Society has certified the curriculum leading to the Bachelor of Science in Chemistry.

The Human Factors and Ergonomics Society has accredited the curriculum leading to the PhD in Engineering Psychology.

The Master of Science in Prosthetics and Orthotics (MSPO) program is accredited by the Commission on Accreditation of Allied Health Education Programs (CAAHEP) upon the recommendation of the National Commission on Orthotic and Prosthetic Education (NCOPE). Accreditation for the MSPO program is effective 2010 to 2015.

- Algorithms, Combinatorics, and Optimization. PhD
- Applied Physics. BS
- Applied Physiology. PhD
- Biochemistry. BS
- Bioinformatics. MS, PhD
- Biology. Minor, BS, MS, PhD
- Chemistry. BS, MS, PhD
- Chemistry & Biochemistry. Minor
- Computational Science and Engineering. MS, PhD
- Earth and Atmospheric Sciences. Minor, BS, MS, PhD
- Health and Medical Sciences. Minor
- Human-Computer Interaction. MS
- Machine Learning. PhD
- Mathematics. Minor, BS, MS, PhD
- Neuroscience. BS
- Ocean Science and Engineering. PhD
- Physics. Minor, BS, MS, PhD
- Physiology. Minor
- Psychology. Minor, BS, MS, PhD
- Quantitative Biosciences. PhD
- Quantitative and Computational Finance. MS
- Robotics. MS
- Statistics. MS

The College of Sciences currently offers minors in biology, earth and atmospheric sciences, and mathematics, along with a number of certificate programs that provide similar opportunities for students to develop their expertise or acquire skills or information in specific areas in addition to their major area. Students who satisfactorily complete a certificate program will receive a certificate of recognition from the department that offers the program. Certificate programs available in the College of Sciences are as follows: (Certificate programs offered by the other colleges at Georgia Tech are also available to students in the College of Sciences.)

Certificate Programs in the College of Sciences

Biological Science

- Applied Physiology
- Biologically Inspired Design

- Biomedical Science
- Biomolecular Technology
- Computational & Quantitative Biology
- Environmental Science
- Integrative Biology
- Marine Science

Physics

- Astrophysics
- Physics of Living Systems

Psychology

- Biopsychology
- Cognitive Psychology
- Engineering Psychology
- Experimental Psychology
- Industrial/Organizational Psychology
- Social/Personality Psychology

School of Biological Sciences

Programs of study offered by the School of Biological Sciences allow students to gain competence in several different areas of modern biological sciences. The curricula in all degree programs in the School encourage breadth by incorporating course selections from other schools and departments. The Institute, with its strengths in science, computing, mathematics, and engineering, provides unique opportunities for careers in the biological sciences and related areas.

The Bachelor of Science degree program consists of a combination of requirements and electives that ensure a balanced background in the fundamental areas of biology, while providing an opportunity to emphasize an area of interest in the junior and senior years. The School also offers graduate programs leading to MS and PhD degrees, as well as five-year BS/MS degrees in Biology and Bioinformatics. The degree programs include coursework, faculty and student seminars, and independent research. Faculty members are actively engaged in research fields such as bioinformatics, biophysics, ecology, evolutionary biology, genetics, mathematical biology, marine science, microbiology, and molecular cell biology.

The Master of Science Degree Program in Prosthetics and Orthotics is accredited by the Commission on Accreditation of Allied Health Education Programs (www.caahep.org) upon the recommendation of the National Commission of Orthotic and Prosthetic Education (NCOPE).

Commission on Accreditation of Allied Health Education Programs
35 East Wicker Drive, Suite 1970
Chicago, IL 60601-2208
312.553.9355

Minor

- Minor in Biology
- Minor in Physiology

Bachelor's Degrees

- Bachelor of Science in Biology
- Bachelor of Science in Neuroscience

Master's Degrees

- Master of Science in Biology
- Master of Science in Bioinformatics
- Master of Science in Computational Science and Engineering

Doctoral Degrees

- Doctor of Philosophy with a Major in Applied Physiology
- Doctor of Philosophy with a Major in Biology
- Doctor of Philosophy with a Major in Bioinformatics
- Doctor of Philosophy with a Major in Computational Science and Engineering
- Doctor of Philosophy with a Major in Ocean Science and Engineering
- Doctor of Philosophy with a Major in Quantitative BioSciences

Graduate Study in Biological Sciences

The School of Biological Sciences provides advanced training and research opportunities in a wide range of biological fields, with laboratories pursuing research in numerous subdisciplines of applied physiology, astrobiology, bioinformatics, computational biology, ecology and evolution, as well as molecular and cellular biology.

Master's Degrees

- Master of Science in Biology
- Master of Science in Bioinformatics
- Master of Science in Computational Science and Engineering

Doctoral Degrees

- Doctor of Philosophy with a Major in Applied Physiology
- Doctor of Philosophy with a Major in Biology
- Doctor of Philosophy with a Major in Bioinformatics
- Doctor of Philosophy with a Major in Computational Science and Engineering
- Doctor of Philosophy with a Major in Ocean Science and Engineering
- Doctor of Philosophy with a Major in Quantitative BioSciences

Undergraduate Study in Biological Sciences

Admission

- Undergraduate Admission

Advising

- Undergraduate Advising

Rules and Regulations

The Catalog is the authoritative source of Rules and Regulations and other Policies for Georgia Tech students.

Health Sciences Requirement

All Georgia Tech students must satisfactorily complete the health and wellness requirement for graduation.

The requirement can be satisfied by completing one of three course options in Applied Physiology: APPH 1040, APPH 1050, or APPH 1060 . APPH 1040 is a two-credit-hour lecture-based course. APPH 1050 is a lecture and physical activity course that meets once per week for 1.5 credit hours of lecture and once per week at the Campus Recreations Center for 1.5 credit hours of structured physical activity. APPH 1060 is a two-credit-hour lecture-based course consisting of both lecture and team-based discussions/activities.

School of Chemistry and Biochemistry

Chemistry has been taught at the Georgia Institute of Technology since the late 1800s with the first Bachelor of Science degree in a chemical subject awarded in 1913. The Lyman Hall building (1905) was the first location on campus to be dedicated to chemistry instruction, but our activities are now spread over six buildings. Today, the School of Chemistry and Biochemistry provides rigorous, engaging, and meaningful training programs in the chemical and biochemical sciences for undergraduate students, graduate students, and postdoctoral scholars. Our community members develop new chemical knowledge and understanding through cutting-edge research that provides a foundation for future intellectual growth and stimulates technological developments that improve the quality of life. The School has had many accomplished students and faculty members. Our graduates have earned prestigious awards such as Fulbright and Rhodes Scholarships, gone on to executive positions in corporate America, and a B.S. graduate won the 1993 Nobel Prize in Chemistry for the invention of the polymerase chain reaction (PCR) method. Our faculty members have won many accolades for their teaching and research. Notably, Prof. Mostafa El-Sayed was awarded the National Medal of Science in 2007.

The School offers coursework, research, and degrees in Chemistry (B.S., M.S. and Ph.D.) and Biochemistry (B.S.). Some of our courses are offered as components of study abroad programs, which our faculty teach in Lyon, France (Summer), Barcelona, Spain (Fall), and New Zealand (Spring). Students can also pursue study abroad opportunities offered by partner universities around the world. All Bachelor of Science in Chemistry students and most Bachelor of Science Biochemistry students undertake research as part of their degree programs. Graduate students in our school can also pursue interdisciplinary degrees in Computational Science and Engineering (M.S. and Ph.D.), Quantitative Biosciences (Ph.D.) and Bioinformatics (Ph.D.). Our undergraduate degrees provide excellent preparation for students interested in direct employment after graduation, medical, dental, and pharmacy school, and for students who wish to pursue a graduate degree in the chemical or biochemical sciences. Our Ph.D. degree provides excellent preparation for careers in research and development, consulting, intellectual property law, and faculty roles at universities and colleges.

All undergraduate concentrations in our Bachelor of Science in Chemistry program (except the Pre-health Option) meet the certification requirements of the American Chemical Society (ACS).

Minors

- Minor in Chemistry & Biochemistry

Bachelor's Degrees

- Bachelor of Science in Chemistry
- Bachelor of Science in Biochemistry

Master's Degrees

- Master of Science in Chemistry
- Master of Science in Computational Science and Engineering

Doctoral Degrees

- Doctor of Philosophy with a Major in Bioinformatics
- Doctor of Philosophy with a Major in Chemistry
- Doctor of Philosophy with a Major in Computational Science and Engineering
- Doctor of Philosophy with a Major in Quantitative Biosciences

Graduate Study in Chemistry and Biochemistry

Master's Degrees

- Master of Science in Chemistry
- Master of Science in Computational Science and Engineering

Doctoral Degrees

- Doctor of Philosophy with a Major in Bioinformatics
- Doctor of Philosophy with a Major in Chemistry
- Doctor of Philosophy with a Major in Computational Science and Engineering
- Doctor of Philosophy with a Major in Quantitative Biosciences

Financial Aid

Financial support is available for graduate study in the School of Chemistry and Biochemistry. The usual form of financial aid for first-year graduate students is a teaching assistantship. Most students beyond their first year are appointed as research assistants. Both teaching and research assistants receive full tuition waivers and a stipend. Additional information on the School's graduate programs is available by contacting the Graduate Coordinator at chemgrad.ask@gatech.edu (Kenyetta.johnson@chemistry.gatech.edu) or or by visiting www.chemistry.gatech.edu.

Undergraduate Study in Chemistry and Biochemistry

Minors

- Minor in Chemistry
- Minor in Biochemistry

Bachelor's Degrees

- Bachelor of Science in Chemistry
- Bachelor of Science in Biochemistry

School of Earth and Atmospheric Sciences

Established in 1970

The School of Earth and Atmospheric Sciences (EAS) is an interdisciplinary program that studies Earth's physical and chemical environment. EAS takes an integrated Earth system science approach in which all components of Earth's system are studied and analyzed as parts of the larger coupled system. The curriculum is designed to provide its graduates with the intellectual insights needed to understand the evolution of Earth's environment and its possible future changes. This integrated approach provides the context for professional training in environmental science and meteorology, as well as specialization for research careers in atmospheric chemistry, aerosols, and clouds; dynamics of weather and climate; geochemistry; geophysics; oceanography; paleoclimate; planetary science; and remote sensing.

Minor

- Minor in Earth and Atmospheric Sciences

Bachelor's Degrees

- Bachelor of Science in Earth and Atmospheric Sciences

Master's Degree

- Master of Science in Earth and Atmospheric Sciences

Doctoral Degrees

- Doctor of Philosophy with a Major in Earth and Atmospheric Sciences
- Doctor of Philosophy with a Major in Ocean Science and Engineering
- Doctor of Philosophy with a Major in Quantitative Biosciences

Graduate Study in Earth and Atmospheric Sciences

Master's Degree

- Master of Science in Earth and Atmospheric Sciences

Doctoral Degrees

- Doctor of Philosophy with a Major in Earth and Atmospheric Sciences
- Doctor of Philosophy with a Major in Ocean Science and Engineering
- Doctor of Philosophy with a Major in Quantitative Biosciences

Graduate Certificate in Geohydrology

Students completing the master's or doctoral degree requirements of the School may be awarded a Multidisciplinary Geohydrology Certificate if their program of study satisfies the requirements of the Multidisciplinary Geohydrology program. Additional details can be found in this catalog under Multidisciplinary Certificate Programs in Engineering.

Graduate Certificate in Remote Sensing

Undergraduate Study in Earth and Atmospheric Sciences

Minor

- Minor in Earth and Atmospheric Sciences

Bachelor's Degrees

- Bachelor of Science in Earth and Atmospheric Sciences

Certificates

The School of Earth and Atmospheric Sciences offers programs of study for non-School majors leading to certificates in two areas of emphasis: geochemistry and solid earth geophysics. Each course must be completed with a **C** or better.

Additional information regarding undergraduate programs, the minor, and the certificate programs is available by contacting the EAS Undergraduate Coordinator

Contact the EAS undergraduate coordinator

EAS: Certificate Information

School of Mathematics

Established in 1952

Mathematics forms an integral part of the curricula of most students at Georgia Tech. Consequently, the School of Mathematics offers a wide range of courses serving students in the various engineering, science, and management disciplines. The School offers programs of study leading to bachelor's, master's, and doctoral degrees in mathematics. Such programs of study serve as preparation for mathematics careers, professional schools, and graduate studies.

In addition to basic courses in mathematics, the School offers a variety of specialized courses at the undergraduate and graduate levels, emphasizing areas related to the research activities of the faculty. These include mathematical analysis, applied mathematics, differential equations and partial differential equations, dynamical systems, geometry, scientific computing, probability, statistics, combinatorics, mathematical physics, topology, and algebra.

The School of Mathematics has excellent computer facilities that are used in conjunction with an increasing number of courses and programs of study. A cooperative plan for students who wish to combine practical experience with academic work is available for mathematics majors.

Minor

- Minor in Mathematics

Bachelor's Degrees

- Bachelor of Science in Mathematics

Master's Degrees

- Master of Science in Computational Science and Engineering
- Master of Science in Mathematics

- Master of Science in Quantitative and Computational Finance
- Master of Science in Statistics

Doctoral Degrees

- Doctor of Philosophy with a Major in Algorithms, Combinatorics, and Optimization
- Doctor of Philosophy with a Major in Bioinformatics
- Doctor of Philosophy with a Major in Computational Science and Engineering
- Doctor of Philosophy with a Major in Machine Learning
- Doctor of Philosophy with a Major in Mathematics
- Doctor of Philosophy with a Major in Quantitative Biosciences

Graduate Study in Mathematics

Master's Degrees

- Master of Science in Computational Science and Engineering
- Master of Science in Mathematics
- Master of Science in Quantitative and Computational Finance
- Master of Science in Statistics

Doctoral Degrees

- Doctor of Philosophy in Algorithms, Combinatorics, and Optimization
- Doctor of Philosophy in Bioinformatics
- Doctor of Philosophy in Computational Science and Engineering
- Doctor of Philosophy in Machine Learning
- Doctor of Philosophy in Mathematics
- Doctor of Philosophy in Quantitative Biosciences

Undergraduate Study in Mathematics

The School of Mathematics offers a Bachelor of Science degree in Mathematics. Students have the option of completing the BS in Mathematics or completing the BS in Mathematics with a concentration in one of five areas:

- Applied Mathematics
- Discrete Mathematics
- Probability and Statistics
- Pure Mathematics.
- Data Science

The BS in Mathematics program emphasizes the study of core mathematics, as well as its application. It provides an excellent preparation for employment, as well as for graduate study in mathematics and related fields.

School of Physics

Established in 1939

Physics involves the study of matter and radiation from the subatomic to the cosmological scale. Revolutionary 20th century advances in quantum physics led to technological breakthroughs including the transistor and laser. Physics has become increasingly important as a fundamental basis for interdisciplinary research in engineering, biophysics, materials science and information. In an increasingly technically oriented society, a physics degree provides an important foundation for a range of careers.

The School of Physics offers basic service courses to freshmen and sophomores, some advanced service courses for students in other units of the Institute, and advanced studies leading to the bachelor's, master's, and PhD degrees in physics. The School seeks to provide elective freedom in its degree programs in order to enable students with a wide variety of goals to construct programs of study suitable for them.

In addition to offering courses in the fundamentals of physics, the School provides numerous specialized courses at all levels, particularly in those areas related to the research interests of the faculty. These areas of research currently include:

- astrophysics (including cosmology, and particle and gravitational astrophysics);
- atomic, molecular, and optical physics;
- condensed matter physics (experimental, theoretical, and computational);
- nonlinear physics and chaos;
- soft matter physics;
- physics education;
- and physics of living systems.

Opportunities exist in all these areas and in other areas through collaboration with faculty of other schools and colleges for Special Problems courses, master's theses, and doctoral dissertations.

Supplementary program planning is available from the School of Physics. Opportunities for graduate study and research are also available at www.physics.gatech.edu.

Minor

- Minor in Physics

Bachelor's Degrees

- Bachelor of Science in Applied Physics
- Bachelor of Science in Physics

Master's Degree

- Master of Science in Computational Science and Engineering
- Master of Science in Physics
- Master of Science in Robotics

Doctoral Degrees

- Doctor of Philosophy with a Major in Computational Science and Engineering
- Doctor of Philosophy with a Major in Physics
- Doctor of Philosophy with a Major in Quantitative Biosciences

Graduate Study in Physics

Master's Degree

- Master of Science in Computational Science and Engineering
- Master of Science in Physics
- Master of Science in Robotics

Doctoral Degrees

- Doctor of Philosophy with a Major in Computational Science and Engineering
- Doctor of Philosophy with a Major in Physics
- Doctor of Philosophy with a Major in Quantitative Biosciences

Undergraduate Study in Physics

Minor

- Minor in Physics

Bachelor's Degrees

- Bachelor of Science in Applied Physics
- Bachelor of Science in Physics

Certificate in Astrophysics

For the Astrophysics Certificate, the following lists the required and optional courses.

Code	Title	Credit Hours
Required Courses		
PHYS 2021	The Solar System	3
or PHYS 20:	Stars, Galaxies, and the Universe	
PHYS 3021	Nuclear Astrophysics and Stellar Evolution	3
Optional Courses		
Select at least two of the following:		6
PHYS 4261	Atomic Physics	
PHYS 4801	Special Topics (if approved by the Chair)	
PHYS 4699	Undergraduate Research (if approved by the Chair)	
Total Credit Hours		**12**

Courses Offered at Georgia State

Code	Title	Credit Hours
ASTR 4000	Fundamentals of Astrophysics	3
ASTR 3500	Fundamentals of Astronomy and Astrophysics	4

School of Psychology

Established in 1959

The School of Psychology offers programs of study leading to the Bachelor of Science in Psychology, Master of Science in Psychology, and Doctor of Philosophy with a major in Psychology. It also offers training in the basic and applied aspects of the science of behavior for the student majoring in architecture, engineering, management, and natural sciences. The undergraduate curriculum provides a broad-based natural science approach to the study of psychology. Courses in mathematics, biology, and chemistry, for instance, complement the psychology courses. The curriculum also stresses methodological issues so that students learn the fundamentals for carrying out solid research.

Minor

- Minor in Psychology

Bachelor's Degree

- Bachelor of Science in Psychology
- Bachelor of Science in Neuroscience

Master's Degrees

- Master of Science in Human-Computer Interaction
- Master of Science in Psychology

Doctoral Degrees

- Doctor of Philosophy with a Major in Psychology

Graduate Study in Psychology

Doctoral candidates take a core curriculum in general psychology and quantitative methods. Doctoral candidates will complete all requirements for the master's degree, which includes writing a research thesis.

The doctoral program provides the student with an opportunity for advanced study in cognitive aging, cognition and brain science, engineering, industrial-organizational, or quantitative psychology. Each of these curricula consists of additional courses and programs of individual study and research beyond the core curriculum, which contribute to a strong background in general experimental psychology and the student's area of specialization. The doctoral program will ordinarily require at least four years for students who enter immediately after obtaining a bachelor's degree.

Admission to graduate study in psychology with full graduate standing in the School of Psychology requires the equivalent of an undergraduate major in psychology or a related field with courses in general and experimental psychology, as well as psychological statistics. All applicants should submit scores from the Graduate Record Examination.

The psychology faculty will consider admissions applications from competent students who have majored in subjects other than psychology.

PSYC: Graduate Information

Master's Degrees

- Master of Science in Human-Computer Interaction
- Master of Science in Psychology

Doctoral Degrees

- Doctor of Philosophy with a Major in Psychology

Undergraduate Study in Psychology

Minor

- Minor in Psychology

Bachelor's Degree

- Bachelor of Science in Psychology

The School of Psychology offers a number of certificate programs that provide similar opportunities for students to develop their expertise or acquire skills or information in specific areas in addition to their major area.

Certificates in Psychology

- Certificate in Biopsychology
- Certificate in Cognitive Psychology
- Certificate in Engineering Psychology
- Certificate in Experimental Psychology
- Certificate in Industrial/Organizational Psychology
- Certificate in Social/Personality Psychology

Certificate Information

Ivan Allen College of Liberal Arts

The Ivan Allen College of Liberal Arts, established in 1990, consists of six schools, three ROTC units and several research centers, and exemplifies strengths in humanities and social sciences. The six schools are: Economics; History and Sociology; Literature, Media, and Communication; Modern Languages; Public Policy; and the Sam Nunn School of International Affairs.

Ivan Allen College provides innovative, human-centered perspectives at the intersections of humanities, social sciences, arts and STEM, developing leaders who advance technology and improve the human condition. Nearly 350 tenured, tenure-track, non-tenure track and permanent research faculty, prepare students to be leaders capable of balancing a richly defined base of expertise with a well-grounded sense of responsibility. Our programs encompass traditional fields as well as unique and professional disciplines. Many of our faculty members engage in groundbreaking, interdisciplinary research to solve complex issues of the world.

We offer 16 bachelor's degrees, including six bachelor-master degree programs, 14 master's degrees, and six Ph.D. programs, including innovative, professionally oriented graduate degrees in sustainability, cybersecurity, applied languages and cultures, global media, digital media, and international affairs.

- African Studies. Minor
- Applied Language & Intercultural Studies. BS, MS
- Chinese. Minor
- City and Regional Planning & Public Policy. MCRP-MS
- Computational Media. BS
- Cybersecurity. MS
- Digital Media. MS, PhD
- East Asian Studies. Minor
- Economics. Minor, BS, MS, PhD
- Economics and International Affairs. BS
- Film and Media Studies. Minor
- French. Minor
- German. Minor
- Global Development. Minor
- Global Economics and Modern Languages. BS
- Health, Medicine, and Society. Minor
- History. Minor
- History, Technology, and Society. BS
- History and Sociology of Technology and Science. MS, PhD
- Human-Computer Interaction. MS
- International Affairs. Minor, BS, MS
- International Affairs and Modern Language. BS
- International Affairs, Science, and Technology. PhD
- International Business, Language, and Culture. Minor
- International Security. MS
- Japanese. Minor
- Korean. Minor
- Latin American and LatinX Studies. Minor
- Law, Science, and Technology. Minor
- Leadership Studies. Minor
- Linguistics. Minor
- Literature, Media, and Communication. BS
- Microeconomics of Strategic Analysis. Minor
- Middle Eastern North African Studies. Minor
- Philosophy. Minor
- Political Science. Minor
- Public Policy. Minor, BS, MS, PhD
- Russian. Minor
- Science, Technology, and Society. Minor
- Social Justice. Minor
- Sociology. Minor
- Spanish. Minor
- Sports, Society, and Technology. Minor
- Women, Science, and Technology. Minor

Joint Degrees

Public Policy Joint Degree with Georgia State University. PhD

Department of Air Force Aerospace Studies

Established in 1946

The Air Force Reserve Officer Training Corps, Air Force ROTC, is a three- or four-year educational program designed to give men and women the opportunity to become Air Force officers while completing a degree. It involves an elective curriculum taken along with required college classes. Students participating in the program will attend Air Force ROTC classes on Tuesdays and Thursdays. Students earn a college degree and an officer's commission in the U.S. Air Force at the same time.

Air Force ROTC offers competitive four, three and a half, three, two and a half, and two year college scholarships to qualified college students based on merit. Non-competitive scholarships are also available based on major, including certain foreign languages and engineering specialties. Scholarships vary from $3,000, $9,000, $15,000, all the way up to full tuition and required fees. Scholarship winners also receive a stipend of up to $500 for each academic month, in addition to a $900 allowance for books and other educational items. Non-scholarship students also receive the stipend and book allowance as Professional Officer Course cadets in the program.

The curriculum is divided into two courses:

- a General Military Course open to all freshmen and sophomores, and
- a Professional Officer Course for qualified juniors, seniors, and graduate students.

Students undecided about pursuing a commission can participate in the General Military Course without incurring a military obligation.

Successful completion of the General Military Course, a minimum 2.0 GPA, and the appropriate physical and medical qualifications are prerequisites for enrollment in the Professional Officer Course. Successful completion of both courses with the award of a bachelor's degree allows students to become commissioned second lieutenants in the United States Air Force.

Air Force ROTC Cross Registration

Cross Registration is available to students from ARCHE participating schools. As a cross-town cadets students will participate in Air Force ROTC activities at Georgia Tech every Tuesday and Thursday. Scholarship opportunities are available to students from schools with Air Force Education Service Agreements. Stipends and other incentives are available to all students. Students graduating with a degree from their home institution will receive a commission in the United States Air Force. Contact the Detachment 165 Unit Admissions Officer at 404.894.4175 for more information. For more information on the cross registration process and ARCHE participating schools, visit www.atlantahighered.org.

Air Force ROTC Website

Air Force ROTC Program Overview

Students entering the program enroll in Air Force ROTC courses in the same manner in which they register for other undergraduate courses. A formal application is not required. Students enrolled in the General Military Course (GMC) incur no military obligation unless they are on an Air Force ROTC scholarship. Those students desiring to become commissioned officers in the Air Force must compete for entry into the Professional Officer course (POC), which is normally the last two years of college. In the summer between the sophomore and junior years, cadets attend a four- or six-week field training session conducted at an Air Force base.

Air Force ROTC Website

Field Training

Field Training is, in most cases, a cadet's first exposure to a working Air Force environment. The program is designed to develop military leadership and discipline, and to provide Air Force officer orientation and motivation. At the same time, the Air Force evaluates each cadet's potential as an officer. Field training includes Air Force professional development orientation, marksmanship training, junior officer training, physical fitness, and survival training.

ROTC Credit
Air Force ROTC Website

General Military Course (GMC)

Courses are offered during fall and spring semesters with two credit hours awarded for each freshman and sophomore course, and 3 credit hours for each junior and senior course. Four hours of basic ROTC courses may be applied as elective credits toward degree requirements at the school. Classes normally meet two hours a week. A one-hour leadership laboratory and participation in physical conditioning training are also required.

Students in the GMC do not incur military obligation unless they have received an ROTC scholarship.

AS 1000 Level Class Schedule for Freshman Year

A survey course designed to introduce students to United States Air Force and Air Force Reserve Officer Training Corps.

Code	Title	Credit Hours
Fall		
AS 1110	Heritage and Values of the Air Force I	1
AS 1000	Air Force Leadership-Lab	1
Spring		
AS 1120	Heritage and Values of the Air Force II	1
AS 1000	Air Force Leadership-Lab	1

AS 2000 Level Class Schedule for Sophomore Year

This course provides the students with a level of understanding for the general element and employment of air and space power.

Code	Title	Credit Hours
Fall		
AS 2210	U.S. Air and Space Power Fundamentals I	1
AS 1000	Air Force Leadership-Lab	1
Spring		
AS 2220	U.S. Air and Space Power Fundamentals II	1
AS 1000	Air Force Leadership-Lab	1

Air Force ROTC Website

Leadership Laboratory (AS 1000)

Leadership Laboratory is a separate course requiring two hours per week throughout the cadet's enrollment in Air Force ROTC. It involves a study of Air Force customs and courtesies, drill and ceremony, professional development opportunities in the Air Force, and the life and work of an Air Force junior officer. Students develop their leadership potential in a practical, supervised laboratory that may include field trips to Air Force installations and presentations by Air Force personnel. Physical Training (PT) is a key part of officer development. Cadets are expected to PT twice per week.

ROTC Credit

Air Force ROTC Website

Professional Officer Course (POC)

Courses are offered during fall and spring semesters with 3 credit hours for each junior and senior course. Classes normally meet 3 hours a week. A one-hour leadership laboratory and participation in physical conditioning training are also required.

AS 3000 Level Class Schedule for Junior Year

A study of leadership, management fundamentals, professional knowledge, and communication skills required of an Air Force junior officer

Code	Title	Credit Hours
Fall		
AS 3310	Leading People and Effective Communication I	3
AS 1000	Air Force Leadership-Lab	1
Spring		
AS 3320	Leading People and Effective Communication II	3
AS 1000	Air Force Leadership-Lab	1

AS 4000 Level Class Schedule for Senior Year

Examines the national security process, Air Force structure, and doctrine with emphasis on developing top-level management skills required of an Air Force junior officer.

Code	Title	Credit Hours
Fall		
AS 4410	National Security and Preparation for Active Duty I	3
AS 1000	Air Force Leadership-Lab	1
Spring		
AS 4420	National Security and Preparation for Active Duty II	3
AS 1000	Air Force Leadership-Lab	1

Air Force ROTC Website

Air Force ROTC Scholarship Program

Air Force ROTC can help students with the high cost of getting a degree. As an Air Force ROTC cadet, students are entitled to many benefits.

- Up to $15,000 per academic year to cover tuition, lab, and incidental fees;
  $750 for textbooks; and $250-$400 a month tax-free allowance
- Free Air Force uniforms and textbooks
- Management training and opportunities to apply leadership principles
- At most schools, academic credit for Air Force ROTC classes
- Travel on military aircraft on a space-available basis for students on Air Force ROTC scholarships or in the Professional Officer course

In-College Scholarship Program (ICSP)

The Air Force ROTC In-College Scholarship Program (ICSP) is a highly competitive scholarship program aimed primarily at college freshmen and sophomores in ANY MAJOR. Detachment commanders nominate and rank/order cadets in their program using the 'whole-person' concept. All ICSP scholarships activate the following fall term.

Historically Black Colleges and Universities (HBCU)

Scholarships are available for any Clark Atlanta, Morehouse, or Spelman student. The objective of the HBCU scholarship program is to encourage outstanding HBCU students to enroll in the Air Force ROTC program. To compete for the scholarship, students must:

- be full-time,
- be physically and medically qualified,
- have at least a 2.5 GPA, and
- meet all other eligibility criteria.

Depending on the situation, HBCU scholarships can be activated in the same term.

Foreign Language Express Scholarship

Foreign Language Express scholarships provide preapproved scholarships to individuals in certain areas of study for which the United States Air Force projects a critical need in a few years. Scholarships in these areas are guaranteed if students meet all minimum requirements. Air Force ROTC provides an outstanding opportunity for students to receive a three-, or two-year scholarship. Depending on the situation, Foreign Language scholarships can be activated in the same term. In order to receive an Express Scholarship students must be in one of the areas of study: Arabic, Chinese, Persian-Iranian/Persian-Afghan, Hindi, Indonesian, Japanese, Pashtu, Russian, Turkish, Urdu/Punjabi, Azerbaijani, Bengali, Cambodian, Hausa, Kazakh, Kurdish, Malay, Serbo-Croatian, Swahili, Thai, Uighur, Uzbek, or Vietnamese.

Nursing Scholarships

Air Force ROTC offers a variety of scholarships for nursing students that cover most tuition, books, and lab fees. The goal of the Nursing scholarships is to allow nursing students to complete their degree debt-free, while acquiring valuable resource knowledge about the Air Force and become part of the Air Force's medical staff. Air Force nurses may enter in any number of different nursing fields including clinical nurse, operating room nurse, flight nurse, or nurse anesthetist. Depending on the situation, Nursing scholarships can be activated in the same term.

Pre-Health Professions and Armed Forces Health Professions Program

A Pre-Health Professions Program designation is offered to encourage students to earn commissions through Air Force ROTC and continue their education in medical or osteopathic school. You must apply before the end of the sophomore year. The Armed Forces Health Professions Scholarship Program provides up to four years of medical school and it covers tuition and fees, textbooks. It also pays the student a taxable monthly allowance of $938. Students accepted to the graduate-level health professions school, will be granted the scholarship and transferred into the Air Force Medical Corps. Armed Forces Health Professions scholarship participants incur an additional active-duty service commitment.

ROTC Credit
Air Force ROTC Website

Department of Military Science/Army ROTC

Established in 1917

The purpose of the Army ROTC is to prepare students for commissioning as officers in the Active Army, Army Reserve, or Army National Guard. The overall program is designed to aid students in developing the abilities and attitudes that will make them academically successful and to develop well-educated junior officers.

The curriculum is divided into two courses:

- a basic course that is open to all freshmen and sophomores and
- an advanced course for qualified juniors, seniors, and graduate students.

Students who are undecided about pursuing a commission have the option of participating in the basic course without incurring a military obligation. Successful completion of the basic course (or commensurate training), a minimum 2.0 cumulative grade-point average, and the appropriate medical and physical qualifications are prerequisites for enrollment in the advanced course. Successful completion of both courses and the award of a bachelor's degree constitute the normal progression to gaining a commission as a second lieutenant. Courses are available to both men and women.

The overall Army ROTC curriculum prepares students to become effective leaders and managers in a variety of responsible and challenging commissioned officer fields, thus facilitating early middle-management career development and progression.

Army ROTC - Additional Training Offered

Leadership Training Course (LTC)

Those academically qualified students who are unable to fulfill the requirements of the Basic Course during their freshman and sophomore years may qualify for admission to the Advanced Course by successfully completing the Leadership Training Course (LTC). This option is primarily designed to meet the needs of transfer students, those completing the sophomore year, and others, including graduate students, who have four semesters remaining at the Institute. This option provides a two-year program in lieu of the standard four-year curriculum. The LTC option consists of a four-week training period conducted at Fort Knox, Kentucky, during the summer months. During each summer, various cycles will be available to meet student needs. Students choosing this option are required to submit a formal application and pass a physical examination.

Students selected to attend the LTC training program will receive approximately $800 in addition to travel expenses to and from the LTC. Uniforms, housing, medical care, and meals are furnished by the government during the training. Interested students should contact the Military Science Department.

Cadet Professional Development Training (CPDT) Program

The CPDT program supplements campus training with practical leader development experiences and some additional skill identifier awarding courses. Cadets train in Army schools and with Active and Reserve units. CPDT consists of two subprograms, Cadet Troop Leader Training (CTLT) and Cadet Practical Field Training (CPFT).

Basic Airborne School (BAC)

The Basic Airborne Course is a three-week training program conducted by the Airborne Department, USAIC, Fort Benning, Georgia that trains students in the use of the parachute as a means of combat deployment. Successful completion qualifies cadets to wear the Parachutist Badge.

Air Assault School (AAS)

Located at Ft. Campbell, Kentucky, the AAS is a 10 day course of instruction that trains cadets on Combat Assault Operations involving associated equipment and U.S. Army rotary-wing aircraft. Successful completion qualifies cadets to wear the Air Assault Badge. This eleven day course is very demanding both physically and mentally, involving obstacle courses and several long ruck marches. You will learn the basics of aircraft familiarization and recognition, slingload operations, and rappelling.

Mountain Warfare School (MWS)

This is a two-week program conducted at the Ethan Allen Firing Range in Jericho, Vermont. The course teaches cadets the skills needed to operate in a mountainous environment during the summer and fall. Mountain Warfare introduces you to the techniques and tactics required to operate in a mountainous environment under hostile conditions. The emphasis is on field exercises where you learn mountain-related skills.

Cadet Troop Leadership Training (CTLT)

Cadet Troop Leadership Training (CTLT) offers the MS III cadet the opportunity to perform the duties of a Second Lieutenant for up to one month with an active duty unit. MS III graduates of the ROTC Advanced Camp may attend CTLT for 3 to 4 weeks immediately following attendance at the Leadership Development and Assessment Course (LDAC) in the summer following their MS III year. Actual duties performed will vary by branch and unit but will generally be those duties expected of a Second Lieutenant in that unit. Many cadets will serve as either platoon leaders or assistant platoon leaders.

ROTC Credit
Army ROTC Website

Army ROTC - Program Overview

The Basic Course Curriculum

The Basic Course consists of a four-semester block of instruction taken during the freshman and sophomore years. Successful completion of all four semesters satisfies the military science requirements for progression to the Advanced Course. These courses provide a foundation in basic military subjects such as customs and traditions, history, leadership, and map reading. They round out a student's academic life, provide a challenge, foster confidence, and facilitate personal growth and development.

Courses are offered during fall and spring semesters with 3 credit hours awarded for each freshman and sophomore course and four credit hours for each junior and senior course. Four hours of basic ROTC courses may be applied as elective credits toward degree requirements at the school. Courses normally meet two hours a week. A one-hour leadership laboratory and participation in physical conditioning training are also required for contracted cadets.

Students in the Basic Course do not incur military obligation unless they have received an ROTC scholarship. Scholarship cadets are required to participate in a field training exercise twice per school year. They are issued uniforms and may participate in other ROTC-related events and training, such as Airborne School, Air Assault School, and Northern Warfare Training.

The Basic Course consists of the following:

Code	Title	Credit Hours
First Year		
MSL 1001	Leadership and Personal Development	3
MSL 1002	Introduction to Tactical Leadership	3
Second Year		
MSL 2001	Innovative Team Leadership	3
MSL 2002	Foundations of Tactical Leadership	3

ROTC Credit
Army ROTC Website

The Advanced Course Curriculum

The Advanced Course is designed to fully develop a cadet's leadership and management potential, physical stamina, and self-confidence, as well as those Army values required of an Army officer. The objective is to produce the highest caliber junior officers fully capable of discharging a wide spectrum of command and management responsibilities in the modern Army and in the business world.

The Advanced Course consists of four semesters of instruction normally taken during the junior and senior years. Successful completion of the four courses fulfills the military science academic requirements for award of an officer's commission. Each student must also participate in a regular physical conditioning program and successfully pass the Army Physical Fitness Test. All Advanced Course students must participate in field training exercises twice a school year. twelve credit hours are earned, six of which may be applied as elective credits toward any degree at the Institute. Advanced Course students receive a subsistence allowance up to $500 a month. Service veterans and service academy cadets may qualify for direct entry into the Advanced Course. Certain Advanced Course students are eligible to participate in the Simultaneous Membership Program with the Army Reserve or Army National Guard. Students in this program affiliate with an Army unit as officer trainees.

Students enrolled in the Advanced Course are also required to complete a five-week Advanced Camp at Fort Lewis, Washington, to become eligible for commissioning. Attendance at Advanced Camp normally occurs during the summer between the junior and senior years. Students may also participate in additional voluntary training, such as Airborne School or Cadet Troop Leader Training. In addition to completing the military science academic requirements of both the Basic and Advanced Courses, the student must complete at least one undergraduate course from each of five designated fields of study:

- Written Communications: Select any course offered by the Institute in English composition or creative writing.
- Human Behavior: Select any course offered by the Institute in psychology, sociology, anthropology, or ethics.
- Military History/National Security Studies: Select course approved by the Professor of Military Science.
- Computer Literacy: Select any course offered by the College of Computing except CS 1000 (Information and Society).
- Mathematics Reasoning: Select any course offered by the School of Mathematics.

Students who successfully complete the Army ROTC curriculum and earn a bachelor's degree can be commissioned as second lieutenants. Subsequent military service may be on active duty or with the Army Reserve or Army National Guard. The following courses constitute the Advanced Course:

Code	Title	Credit Hours
Third Year		
MSL 3001	Adaptive Tactical Leadership	4
MSL 3002	Leadership in Changing Environments	4
Fourth Year		
MSL 4001	Developing Adaptive Leaders	4
MSL 4002	Leadership in a Complex World	4
MSL 4901	Special Problems (restricted)	4

ROTC Credit
Army ROTC Website

Army ROTC - Scholarship Programs

Each year, the Army offers a variety of full scholarship programs to those young men and women who have demonstrated outstanding academic scholarship and leadership potential. Four-, three-, and two-year scholarships are available to qualified students. Scholarships are competitive and awarded based on the student's merit. The Professor of Military Science receives an allocation of scholarships each year. Scholarships provide full tuition/fees or room/board to both resident and out-of-state students, $1,200 allowance for textbooks and supplies, and a $300 to $500-a-month tax-free stipend. Scholarship students serve either on active duty, in the Army reserves, or Army National Guard.

Options

Students who wish to obtain a commission as an officer but do not want to serve on active duty may request a Guaranteed Reserve Forces Duty (GRFD) scholarship. Reserve Forces Duty scholarships are available, but are limited in number. Affiliation with an Army Reserve or Army National Guard unit is required to participate in either the scholarship or nonscholarship program. In this program, students are guaranteed in writing that they will not be placed on active duty and can fulfill their entire commitment in the Army Reserve or Army National Guard.

ROTC Credit
Army ROTC Website

Army ROTC - Student Advisory Services

Faculty members are available throughout the academic year and during each summer orientation session in the Department of Military Science for academic counseling, schedule planning, and career guidance. Students and their parents are encouraged to seek advice on the overall Army ROTC program, scholarship opportunities, and officer career development. Appointments may be made in person, by calling 404.894.4760/9938, or by e-mail via the ROTC home page, www.armyrotc.gatech.edu. Students should also check the homepage for the latest updates on course requirements and other important information.

Academic Mentorship Program

The Academic Mentorship program aims to sustain an atmosphere where all cadets recognize the importance of academic success for commissioning, obtaining their degrees, and other future endeavors.

Every cadet should have the resources and encouragement to succeed in the classroom through an established mentorship support system. An aggressive attitude toward meeting the academic standard is highly encouraged. Academic Mentorship also offers a Study Hall program which offers additional mentorship opportunities by offering students hands on academic instruction and tutelage.

ROTC Credit
Army ROTC Website

Department of Naval Science / NROTC

Established in 1926

The NROTC program offers students the opportunity to qualify for service as commissioned officers in the United States Navy or Marine Corps. The program's objectives are to provide students with an understanding of the basic concepts and principles of naval science, associated professional knowledge, and the requirements for national security. NROTC students receive an educational background that allows them to later undertake advanced education in the naval service.

The NROTC program is an officer accession program for the unrestricted line communities (Surface Warfare, Submarines, Aviation, Marine Corps). Upon graduation, the student is commissioned as an officer in the Navy or Marine Corps. Naval officers are ordered to active duty in submarines, surface combatants, or the aviation community. Marines undergo training leading to a variety of specialties. NROTC students are enrolled in one of the following three categories: three-year or four-year scholarship students, college programmers, or two-year scholarship students.

The NROTC Program was established to develop midshipmen mentally, morally and physically and to imbue them with the highest ideals of duty, and loyalty, and with the core values of honor, courage and commitment in order to commission college graduates as naval officers who possess a basic professional background, are motivated toward careers in the naval service, and have a potential for future development in mind and character so as to assume the highest responsibilities of command, citizenship and government.

NROTC - College Program Students

Non-scholarship students may seek a naval commission through the NROTC College Program. Interested students may apply at the NROTC unit in the O'Keefe building on campus. The process includes a review of previous academic performance and interviews with staff personnel. Students accepted into the College Program must complete the naval science curriculum and take a summer assignment between the junior and senior years.

The Navy provides naval science texts. Students who enter advanced standing in the junior year receive a subsistence allowance of $350-$400 per month. College program students are eligible to compete for scholarships ranging from one to three years. Selection criteria are based on academic performance at Georgia Tech and military performance as a College Program student. For information, contact the Naval Science Department at 404.894.4771.

ROTC Credit
Navy ROTC Website

NROTC - Program Overview

Naval Science Classes

All Navy Option Scholarship students must take:

Code	Title	Credit Hours
Required Courses		
NS 1321	Introduction to Naval Sciences	3
NS 1323	Naval Maritime History	3
NS 2321	Naval Leadership and Management	3
NS 2323	Navigation (Naval only)	3
NS 3323	Evolution of Warfare (Marine only)	3
NS 3324	Marine Weapons and Tactics	3
NS 3325	Naval Weapons Systems (Naval only)	3
NS 3326	Naval Engineering Systems (Naval only)	3
NS 4320	Naval Operations and Seamanship (Naval only)	3
NS 4322	Naval Leadership and Ethics	3
NS 4333	Fundamentals of Maneuver Warfare	3
Additional Courses		
MATH 1551 & MATH 1552	Differential Calculus and Introduction to Linear Algebra Integral Calculus	
Select one of the following:		8-10
PHYS 2211 & PHYS 2212	Introductory Physics I and Introductory Physics II	
PHYS 2231 & PHYS 2232	Honors Physics I and Honors Physics II	
One term of INTA (contact NROTC unit for required class)		
One term of a cultures studies course (contact NROTC unit for required class)		

All students must attend weekly Drill Periods in addition to above courses.

Marine Option

Marine Option students must only take the previously listed international affairs and cultural studies courses or their equivalent as approved by the professor of naval science.

Any additional requirements are based on whether or not the student is in a technical or nontechnical major, a Navy Option or Marine Option student, and a scholarship or nonscholarship recipient. Each student must obtain from the NROTC Department a complete description of program requirements since the above statement is only a general outline. Students may apply a maximum of 4 credit hours in basic ROTC courses and six credit hours in advanced ROTC courses toward meeting the free elective requirements for any degree.

ROTC Credit
Navy ROTC Website

NROTC - Scholarship Students

Four-year and three-year scholarship students are selected through nationwide competition. Selection criteria include SAT or ACT scores, high school academic performance, and extracurricular activities. The selection process is administered by the chief of Naval Education

and Training; however, the NROTC unit will provide guidance and information to applicants. An online application is available at http://www.nrotc.navy.mil.

The NROTC scholarship pays for tuition (and applicable fees) and textbooks. The Navy also provides uniforms and a $250-$400 per month subsistence allowance. The Naval Science Department conducts an orientation program (INFORM) for all new NROTC scholarship students during the week prior to the start of the fall semester. Scholarship students must complete the naval science curriculum and also participate in summer assignments from four to six weeks during the summers between academic years.

ROTC Credit
Navy ROTC Website

NROTC - Two-Year Scholarship Program

Sophomores may apply and compete nationally for two-year NROTC scholarships. Those selected attend six weeks of training in Newport, Rhode Island, during the summer between the sophomore and junior years. Upon successful completion, the student joins the NROTC program on an equal footing with other students in the junior year naval science classes. Interested students should contact the Naval Science Department.

ROTC Credit
Navy ROTC Website

School of Economics

The School of Economics provides high-quality programs of study leading to a Bachelor of Science in economics. The School also offers a minor in economics and a minor in the microeconomics of strategic analysis for students in other disciplines. The school participates in the International Plan and the Research Option for undergraduate students. The economics curriculum focuses on skills and knowledge critical for a life of learning and leads to careers in business, banking, consulting, management, non-profits and the public sector. A degree in economics is also a strong foundation for students intending to pursue advanced degrees in the social sciences and professional degrees in management (MBA), law, and public administration.

Modern economics is analytically rigorous and requires a background in mathematics and statistics. At the same time, it is critically linked with the other social sciences and humanities, as well as to applied management and policy studies. The undergraduate curriculum provides a strong, in-depth understanding of economic thought and policy in a wide variety of fields including health, environmental management, global development and international economics, and business economics, and is intended to prepare students for productive careers, for useful roles in society, and for satisfying personal lives in a technologically complex, culturally diverse world.

The School of Economics offers

- a STEM Certified Bachelor of Science in Economics
- a Bachelor of Science in Economics and International Affairs in cooperation with the Sam Nunn School of International Affairs
- a Bachelor of Science in Global Economics and Modern Languages in cooperation with the School of Modern Languages

These programs provide students an opportunity to broaden their educational experience and to enhance their marketability in these areas.

The School of Economics also offers a STEM Certified Master of Science in Economics and a STEM Certified PhD in Economics.

Minors

- Minor in Economics
- Minor in Microeconomics of Strategic Analysis

Bachelor's Degrees

- Bachelor of Science in Economics
- Bachelor of Science in Economics and International Affairs
- Bachelor of Science in Global Economics and Modern Languages

Master's Degree

- Master of Science in Economics

Doctoral Degree

- Doctor of Philosophy with a Major in Economics

Graduate Study in Economics

Master's Degree

- Master of Science in Economics

Doctoral Degree

- Doctor of Philosophy with a Major in Economics

Graduate Certificate in Science, Technology, and Society

The Graduate Certificate in Science, Technology, and Society Graduate is designed for students already enrolled in a graduate degree program at Georgia Tech. This certificate is for graduate students who would like to demonstrate additional competence in some aspect of STS or special competence in STS in their home discipline. The certificate is open to students in good standing in any graduate program at Georgia Tech.

The 12-credit hour certificate program helps students to:

- Understand the social, cultural, and epistemic dynamics of science and technology
- Explore these dynamics across world societies and cultures
- Develop sensitivity to issues of gender, race, and justice across areas of knowledge, including: engineering, medicine, environment, cognition, security, innovation, design
- Employ STS approaches as scholars or practitioners (e.g. engineers, scientists, or policy makers)

Program of Study

4 Courses Total

Code	Title	Credit Hours
Core Courses		
Select one of the following:		3
HTS/PUBP/LMC 6743	Science, Technology & Soceity: Core Seminar	
HTS 6118	Science, Technology and the Economy	
HTS 6121/ INTA 8803	Science, Technology, and National Security	
HTS 6123/ LMC 8803	Social and Cultural Studies of Biomedicine	
HTS 6124	Science and Technology Beyond Borders	
PUBP/LMC 6748	Social Justice, Critical Theory, and Philosophy of Design	
LMC/PUBP 6749	Feminist Theory and STS	
Elective		
Elective [1]		3
Total Credit Hours		**6**

[1] Select up to one other Elective, subject to student interest and STS Coordinator approval. Many appropriate courses are offered across the Ivan Allen College and the Institute, for example: CS 8893.

Undergraduate Study in Economics

Minors

- Minor in Economics
- Minor in Microeconomics of Strategic Analysis

Bachelor's Degrees

- Bachelor of Science in Economics
- Bachelor of Science in Economics and International Affairs
- Bachelor of Science in Global Economics and Modern Languages

School of History and Sociology

Established in 1990

The School of History and Sociology, dedicated to the ideal of a well-rounded education at a technological university, provides instruction in the social sciences to every student at Georgia Tech. The School offers courses in history and sociology leading to three degrees:

- Bachelor of Science in History, Technology, and Society (BS-HTS);
- Master of Science in History and Sociology of Technology and Science (MS-HSTS); and
- Doctor of Philosophy in History and Sociology of Technology and Science (PHD-HSTS).

The School of History and Sociology also offers minors or participates in interdisciplinary minors in:

- History;
- Sociology;
- Health, Medicine, and Society;
- Science, Technology, and Society;
- Social Justice;
- Sports, Society, and Technology; and
- Women, Science, and Technology.

The School of History and Sociology also offers several certificate programs for students in other undergraduate majors. In addition, the School of History and Sociology participates in the International Plan and Research Option.

Minors

- Minor in History
- Minor in Sociology
- Minor in Health, Medicine, and Society
- Minor in Science, Technology and Society
- Minor in Social Justice
- Minor in Sports, Society, and Technology
- Minor in Women, Science, and Technology

Bachelor's Degree

- Bachelor of Science in History, Technology, and Society

Master's Degree

- Master of Science in History and Sociology of Technology and Science

Doctoral Degree

- Doctor of Philosophy with a Major in History and Sociology of Technology and Science

Graduate Study in History and Sociology

Master's Degree

- Master of Science in History and Sociology of Technology and Science

Doctoral Degree

- Doctor of Philosophy with a Major in History and Sociology of Technology and Science

Graduate Certificate in Science, Technology, and Society

The Graduate Certificate in Science, Technology, and Society is designed for students already enrolled in a graduate degree program at Georgia Tech. This certificate is for graduate students who would like to demonstrate additional competence in some aspect of STS or special competence in STS in their home discipline. The certificate is open to students in good standing in any graduate program at Georgia Tech.

The 12-credit certificate program helps students to:

- Understand the social, cultural, and epistemic dynamics of science and technology
- Explore these dynamics across world societies and cultures

- Develop sensitivity to issues of gender, race, and justice across areas of knowledge, including: engineering, medicine, environment, cognition, security, innovation, design
- Employ STS approaches as scholars or practitioners (e.g. engineers, scientists, or policy makers)

Program of Study

4 courses total

Code	Title	Credit Hours
Core Course		
Select one of the following:		3
HTS/PUBP/LMC 6743	Science, Technology & Soceity: Core Seminar	
HTS 6118	Science, Technology and the Economy	
HTS 6121/ INTA 8803	Science, Technology, and National Security	
HTS 6123/ LMC 8803	Social and Cultural Studies of Biomedicine	
HTS 6124	Science and Technology Beyond Borders	
PUBP/LMC 6748	Social Justice, Critical Theory, and Philosophy of Design	
LMC/PUBP 6749	Feminist Theory and STS	
Elective		
Elective [1]		3
Total Credit Hours		**6**

[1] Select up to one other elective, subject to student interest and STS Coordinator approval. Many appropriate courses are offered across the Ivan Allen College and the Institute, for example: CS 8893.

Undergraduate Study in History and Sociology

Minors

- Minor in History
- Minor in Sociology
- Minor in Health, Medicine, and Society
- Minor in Science, Technology and Society
- Minor in Sports, Society, and Technology
- Minor in Social Justice
- Minor in Women, Science, and Technology

Bachelor's Degree

- Bachelor of Science in History, Technology, and Society

Certificate Programs

Alone or in conjunction with other units of the Ivan Allen College, the School of History and Sociology offers certificates in five fields:

- African American Studies
- Asian Affairs
- European Affairs
- History
- Sociology

For more information on the certificate programs, go to https://hsoc.gatech.edu/undergraduate/certificates.

School of Literature, Media, and Communication

Established in 1990

The School of Literature, Media, and Communication (LMC) is engaged in rethinking the role of humanities education in an increasingly technological and global environment. The faculty is committed to generating humanistic perspectives on a technological world through interdisciplinary research in cultural studies and new media studies at both theoretical and applied levels. In providing humanities and communication courses for all Georgia Tech undergraduates, LMC's curriculum focuses on the scientific and technologically oriented aspects of the humanities, as well as on the incorporation of new electronic media (visual, aural, and textual) into humanities and communication education.

LMC offers a BS in Literature, Media, and Communication (LMC), a BS in Computational Media (CM) jointly administered with the College of Computing; a BS/MS combination in LMC and DM; a MS in Global Media and Cultures jointly offered with Modern Languages; and an MS and a PhD in Digital Media (DM). The School also participates in the interdisciplinary MS in Human-Computing Interaction (HCI), in conjunction with the Schools of Interactive Computing, Industrial Design, and Psychology. Graduates from LMC's undergraduate and graduate programs are positioned to assume important roles in the exciting new fields developing in the interface between technology and culture.

The BS in LMC (formerly the BS Science, Technology, and Culture) is the oldest undergraduate degree program in the Ivan Allen College for the Liberal Arts at Georgia Tech. This program offers a thorough education in the different modes of representation that structure our increasingly technological and global world. Program graduates will have both significant theoretical and hands-on experience with novels, films, games, comic books, web pages, and scientific documents. By learning the modes of communication common to science, technology, and the humanities, LMC graduates are prepared to become leaders in education, business, and the arts.

CM is one of Georgia Tech's fastest-growing programs, going from three students in 2004 to 230 today. The BSCM curriculum gives students a grasp of the computer as a medium: the technical, the historical-critical, and the applied. Students gain significant hands-on and theoretical knowledge of computing, as well as an understanding of visual design and the history of media. CM graduates are uniquely positioned to plan, create, and critique new digital media forms for entertainment, education, and business.

The DM program provides students with a foundational, theoretical background in digital media and the opportunity to practice what is learned in the classroom through active participation in labs and research. MS DM students follow a studio-based curriculum with three core themes (Creativity & Knowledge, Arts & Entertainment, and Civic Media) that prepare students for professional careers in digital media, including: interaction and information design, game design and production, and interactive media design. The PhD program educates

research-oriented theorists/practitioners who bring the traditions of the humanities and arts to the design of digital media. Graduates of the program are prepared to work in industry, public service, and universities, shaping the emerging digital genres and expanding our understanding and mastery of the representational power of the computer.

The MS HCI degree program is a cooperative effort of the School of Interactive Computing; the School of Literature, Media and Communication; the School of Industrial Design, and the School of Psychology. The program provides students with the practical and interdisciplinary skills and theoretical understanding they will need to become leaders in the design, implementation, and evaluation of the computer interfaces of the future.

The newest MS program in LMC is the MS in Global Media and Culture. Offered jointly by LMC and Modern Language, this degree provides students with essential skills in communication, knowledge of media, and global expertise. Students in the program will choose to study one of the following languages (Chinese, French, German, Japanese, Russian, or Spanish) and will also create a portfolio through internships, research, media production, and study abroad.

Minors

- Minor in Film and Media Studies
- Minor in Science Fiction Studies
- Minor in East Asian Studies
- Minor in Health, Medicine, and Society
- Minor in Science, Technology, and Society
- Minor in Women, Science, and Technology

Bachelor's Degrees

- Bachelor of Science in Computational Media
- Bachelor of Science in Literature, Media, and Communication

Master's Degrees

- Master of Science in Digital Media
- Master of Science in Global Media and Cultures
- Master of Science in Human-Computer Interaction

Doctoral Degree

- Doctor of Philosophy with a Major in Digital Media

Graduate Study in Literature, Media, and Communication

Master's Degrees

- Master of Science in Digital Media
- Master of Science in Human-Computer Interaction

Doctoral Degree

- Doctor of Philosophy with a Major in Digital Media

Science, Technology and Society Graduate Certificate

The Science, Technology and Society Graduate Certificate is designed for students already enrolled in a graduate degree program at Georgia Tech.

This certificate is for graduate students who would like to demonstrate additional competence in some aspect of STS or special competence in STS in their home discipline. The certificate is open to students in good standing in any graduate program at Georgia Tech.

The 12-credit hour certificate program helps students to:

- Understand the social, cultural, and epistemic dynamics of science and technology
- Explore these dynamics across world societies and cultures
- Develop sensitivity to issues of gender, race, and justice across areas of knowledge, including: engineering, medicine, environment, cognition, security, innovation, design
- Employ STS approaches as scholars or practitioners (e.g. engineers, scientists, or policy makers)

Program of Study

4 Courses Total

Code	Title	Credit Hours
Core Courses		
Select one of the following:		3
HTS/PUBP/LMC 6743	Science, Technology & Soceity: Core Seminar	
HTS 6118	Science, Technology and the Economy	
HTS 6121/INTA 8803	Science, Technology, and National Security	
HTS 6123/LMC 8803	Social and Cultural Studies of Biomedicine	
HTS 6124	Science and Technology Beyond Borders	
PUBP/LMC 6748	Social Justice, Critical Theory, and Philosophy of Design	
LMC/PUBP 6749	Feminist Theory and STS	
Elective		
Elective [1]		3
Total Credit Hours		**6**

[1] Select up to one other elective, subject to student interest and STS Coordinator approval. Many appropriate courses are offered across the Ivan Allen College and the Institute, for example: CS 8893.

Undergraduate Study in Literature, Media, and Communication

Minors

- Minor in Film and Media Studies
- Minor in Science Fiction Studies
- Minor in East Asian Studies
- Minor in Health, Medicine, and Society
- Minor in Science, Technology, and Society
- Minor in Women, Science, and Technology
- Minor in Black Media Studies

Bachelor's Degrees

- Bachelor of Science in Computational Media
- Bachelor of Science in Literature, Media, and Communication

Writing and Communication Intensive Courses

A number of majors require students to complete writing intensive and communication intensive courses. Several LMC classes may be counted toward this requirement. Consult course offerings each semester to determine which courses may be counted toward this requirement.

Advanced Placement

- Students with a score of 4 or 5 on the College Board Advanced Placement Exam (taken in conjunction with high school classes) in Composition and Literature or Language and Composition receive credit for ENGL 1101.
- Students with a score of 750 or higher on the SAT II Subject Test in English receive credit for ENGL 1101.
- Students with a score of four or higher on the International Baccalaureate Exam receive credit for ENGL 1101.
- Advanced placement credit is not ordinarily given for ENGL 1102.

More Adv Placement Information

Certificate Programs

LMC and the School of History and Sociology cooperate in providing a certificate in African American Studies. Students should consult either school for detailed information concerning requirements. Courses for this certificate are selected from among those listed in "Courses of Instruction" and from the list offered by the department.

School of Modern Languages

The School of Modern Languages: "Change the Conversation: Cross-Cultural Expertise for Global Leadership"

The School of Modern Languages is a national leader in the study of cultures, languages, linguistics, and media. For more than a century, we have offered applied studies in foreign languages that are designed to develop advanced communication skills and professional competency in the language. We champion Georgia Tech's mission of "creating the next…" and believe that the next world leaders, entrepreneurs, scientists, engineers, doctors, and creative thinkers should be globally conscious. Learning applicable language, intercultural, and interdisciplinary skills is essential for meeting today's global challenges and fostering sustainable communities. We thus encourage all students from all disciplines to be curious and to expand their capacities within our variety of programs, which include 3 B.S. degrees, 12 minors, and 8 certificates:

Bachelor of Science Degrees:

Applied Languages and Intercultural Studies (ALIS)

International Affairs and Modern Languages (IAML)

Global Economics and Modern Languages (GEML)

Language Minors: Chinese, French, German, Japanese, Korean, Russian, and Spanish as well as Linguistics

Area Studies Minors: African Studies, East Asian Studies, International Business, Language, and Culture, Latin American and LatinX Studies, and Middle Eastern and North African Studies

Certificates: Chinese, French, German, Japanese, Korean, Russian, and Spanish as well as Linguistics.

Our faculty are consistently recognized for their impactful and interdisciplinary research, artistic creation, innovations in curriculum development, expertise in study abroad, and close collaboration with industry professionals. As scholars and educators, we are proud of our established strengths in equipping the next generation of global leaders with the essential knowledge, skills, and professional opportunities necessary to foster meaningful communicative and cultural interactions. Our cross-disciplinary partnerships enable the exchange of diverse perspectives. We support the pursuit of purposeful and innovative scholarship, education, and careers that generate lasting and positive social change.

Minors

- Minor in Chinese
- Minor in East Asian Studies
- Minor in European Studies
- Minor in French
- Minor in German
- Minor in Japanese
- Minor in Linguistics
- Minor in Korean
- Minor in Russian
- Minor in Spanish

Bachelor's Degrees

- Bachelor of Science in Applied Languages & Intercultural Studies
- Bachelor of Science in Global Economics and Modern Languages
- Bachelor of Science in International Affairs and Modern Language

Master's Degrees

- Master of Science in Applied Languages and Intercultural Studies

Undergraduate Study in Modern Languages

Minors

- Minor in Chinese
- Minor in East Asian Studies
- Minor in European Studies
- Minor in French
- Minor in German
- Minor in International Business, Language, and Culture
- Minor in Japanese
- Minor in Korean
- Minor in Linguistics
- Minor in Middle Eastern and North African Studies
- Minor in Russian
- Minor in Spanish

Bachelor's Degrees

- Bachelor of Science in Applied Language & Intercultural Studies
- Bachelor of Science in Global Economics and Modern Languages
- Bachelor of Science in International Affairs and Modern Language

College Credit for High School Study

Modern Languages will grant 6 to 8 hours of credit in any language taught by the School for high school study in that language, provided the student has two or more years of high school credit in the language in question and has completed six credit hours at the 2000, 3000, or 4000 level with an average grade of C or higher. To have the credit entered on their records, students must submit the Modern Languages Proficiency Credit (Advanced Standing) form http://www.registrar.gatech.edu/docs/pdf/advstanding-ml.pdf to the School of Modern Languages for its approval, and pay $90 for each 3 or 4 hours of credit. No grade is attached to this credit, but the credit can fulfill the humanities requirement for graduation.

- Students submitting a score of four or five on the Advanced Placement (AP) Examination in French, German, or Spanish "Language Level III" or "Literature Level III" may receive six hours of credit for courses numbered 2001-2 in the respective language.
- For the Japanese AP exam, students who receive
  - a score of three can earn three hours of credit for JAPN 2002;
  - a score of four can earn six hours of credit for JAPN 2002 and JAPN 3001;
  - a score of five can earn six hours of credit for JAPN 3001 and JAPN 3002.
- For the Chinese exam, students who receive
  - a score of three can earn three hours of credit for CHIN 2002;
  - a score of four can earn six hours of credit for CHIN 2002 and CHIN 3003;
  - a score of five can earn six hours of credit for CHIN 3003 and CHIN 3004.
- Students who submit language scores of five or above for courses taken at the higher level from a certified high school International Baccalaureate program may also receive credit for courses numbered 2001-2 in French, German, or Spanish, for 3001-2 in Japanese, and for 3003-4 in Chinese.

Students with credit for the DSD German language exam may receive the following credit: DSD I: GRMN 3XXX (3 hours); DSD II: GRMN 3XXX (6 hours). Students may not receive credit for both the DSD I and DSD II.

Official scores should be sent to the Registrar's office for processing.

The School will not grant credit for high school study in a foreign language to students who have taken 1000 level courses in that language or the equivalent at Georgia Tech, or at other college-level institutions for which they have received transfer credit.

Graduate Course Option

Under the Graduate Course Option, undergraduate students with a final grade-point average of 3.5 or higher may count six credit hours of their undergraduate credits toward a master's degree at Georgia Tech in the same field. This means that qualified IAML students could complete the Master of Science in International Affairs with thirty additional credit hours rather than 36 credit hours if they chose to further their study in International Affairs; likewise, qualified GEML students could complete the MS in Economics with thirty additional credit hours in ECON courses.

Graduate Course Option Information

Humanities Credits

Each course is essentially a unit in itself, but beginning students are encouraged to pursue at least the elementary two-semester sequence (1001 and 1002) in order to achieve a minimum level of proficiency and to receive humanities credit for both courses. Humanities credit is awarded for Modern Languages 1001 classes upon successful completion of the corresponding 1002 classes. In some instances, students may complete a Modern Languages course at 1001 and then be placed at the second-semester level and complete the 2001 level course. Therefore, the sequence that will warrant HUM credit for Modern Languages courses may be either the 1001-1002 or the 1001-2001 sequence. Students may not enroll in or receive advanced standing for 1000 level courses after the successful completion of any 2000, 3000 or 4000 level course; nor can credit be earned for 2000 level courses after successful completion of any 3000 or 4000 level course. Courses at the 3000 and 4000 level do not have to be taken in chronological order, provided prerequisites are fulfilled.

With minor exceptions, students can fulfill their humanities requirement for graduation by taking courses in the School of Modern Languages, including linguistics courses and courses taught as ML courses (courses in a language not yet included in the General Catalog). Students should consult the Catalog course descriptions and the section of this catalog titled "Humanities and Social Sciences Requirements," in order to determine which courses are classified as humanities in their respective colleges. With the approval of their major schools, students may take any course offered by the School of Modern Languages on a pass/fail basis.

Humanities Information

Minor Programs

The School of Modern Languages offers minors in Chinese, French, German, Japanese, Korean, and Spanish as well as in Russian Studies. This program is designed for students who wish to develop their language skills to at least an intermediate level and to provide themselves with a greater depth than possible with a certificate program.

1. Students must earn 15 credit hours of language electives in a single language beyond the 2002 course.
   a. Students may include the 2002 course for CHIN/JAPN/KOR/RUSS (or the 2011 course in CHIN)
   b. All 15 hours of 3/4000-level courses for FREN/GRMN/SPAN
   c. Students pursuing a minor in Russian Studies should take their electives in at least two different departments/schools (Modern Languages, International Affairs, and/or Literature, Media, and Communication)
2. A maximum of 9 semester hours of transfer credit is allowed in each minor. All courses counting toward a minor must be taken on a letter-grade basis, and a grade of C or better must be received in each course.

Students wishing to pursue one or more of these minors should declare the minor by filling out the minor change form with the Director of Undergraduate Studies in Modern Languages

Minor Program of Study & Guidelines

Modern Language Minor Information

Study Abroad

The School of Modern Languages offers special summer immersion programs in China, France, Senegal, Germany, Japan, Korea, Russia, Ecuador, Mexico, Peru, and Spain. These intensive programs in Languages for Business and Technology (LBAT) consist of six to eight weeks of study abroad in which classroom lessons in business, culture, and technology are combined with field work, cultural events, excursions, and visits to area businesses — all conducted in the target language. The LBAT experience offers a unique opportunity for rapid growth in proficiency, to build a deeper appreciation for the cultures and lifestyle patterns of other peoples, and to make lifelong social and professional contacts. Students will earn nine to fifteen credit hours (depending on the language program and the options available) at the 3000 level; in some programs, lower-division language courses are offered. These credits count toward a certificate, a minor, or the joint majors with International Affairs and Economics or ALIS degree. Program costs vary according to the country visited and the length of the program.

Study Abroad Information

Study Abroad and Internships

In collaboration with the Colleges of Engineering and Computing, the School of Modern Languages has initiated a Study Abroad and International Internship program that incorporates intensive applied language acquisition and cultural study. Students who participate in this program can expect to become versed in a foreign culture, fluent in a second language on professional and social levels, and gain advanced practical experience in their field. This program will prepare students for leadership positions in the global workforce in business, industry, and government.

Modern Languages works with international companies and with the Georgia Tech Center for Career Discovery and Development to establish internships and jobs abroad. Programs generally include one semester of study followed by a six month internship with a global company (some limitations as to language and field of study exist). The LBAT summer immersion course or equivalent is recommended, since students will need to take classes in the language spoken. HOPE scholarships and other financial aid apply. Additional language classes are available abroad. Students retain regular status at Georgia Tech by enrolling in FS 4000 during the semester of study and in INTN 3011, INTN 3015, INTN 3018, and in the Modern Language or Co-op International Internship (INTN 3011 or COOP 3011) during the internship. Students participating in this program are encouraged to contact their academic advisors, the International Division in the Center for Career Discovery and Development, the Office of International Education, and Modern Languages advisors. See www.modlangs.gatech.edu for more information.

Study Abroad Information

Suggested Placement

Students who have never completed any course for high school or college credit in the language should begin in a 1001 course. Students with previous study in Chinese, French, German, Japanese, Russian, and Spanish should take the placement test found at www.modlangs.gatech.edu in order to determine their optimal beginning placement. Students interested in any of the other languages should consult with a language advisor for beginning placement. See www.modlangs.gatech.edu for more information.

Linguistics Certificate

The Linguistics Certificate consists of 12 credit hours.

Track A: General Linguistics

Code	Title	Credit Hours
Required Course		
LING 2100	Introduction to Linguistics	3
Additional Courses		
Select nine credit hours from the following:		9
LING 3813/4813	Special Topics [1]	
SPAN 4170	Spanish Applied Linguistics	
PSYC 2760	Human Language Processing	
PSYC 3011	Cognitive Psychology	
PSYC 3790	Introduction to Cognitive Science	
PSYC 4200	Advanced Topics in Cognitive Psychology	
FREN 3030	French Phonetics	
JAPN 4750	Japanese Discourse and Grammar	
JAPN 4780	Japanese Applied Linguistics	
SPAN 4165	Bilingualism in the Spanish Speaking World	
SPAN 4170	Spanish Applied Linguistics	
Total Credit Hours		**12**

[1] Three credit hours maximum; focus on the linguistic system(s) of selected languages; must be approved by Linguistics advisor

Track B: Language Processing

Track B: Language Processing is a joint collaboration between the School of Modern Languages and the College of Computing. This certificate is designed with computer science majors in mind who have an interest in linguistics and natural language processing.

Code	Title	Credit Hours
Required Course		
LING 2100	Introduction to Linguistics	3
Additional Courses		
Select nine credit hours from the following:		9
CS 3240	Languages and Computation	
CS 3600	Introduction to Artificial Intelligence	
CS/PSYC 3790	Introduction to Cognitive Science	
CS 3803	Special Topics [1]	
or CS 4803/ LING 381	Special Topics	
CS 4641	Machine Learning	
CS 4650	Natural Language Understanding	
PSYC 2760	Human Language Processing	
Total Credit Hours		**12**

[1] Three credit hours maximum; must be approved by Linguistics advisor

For Track B students, other courses listed under the AI thread or in Linguistics may also count with prior approval from the linguistics advisor.

All courses counting towards a LING certificate must be taken on a letter grade basis and a grade of C or better must be received in each course.

Other information:

1. The School of Modern Languages may also accept one linguistics course on the 3000- or 4000-level taken at other accredited universities for either Track A or Track B. Students wanting to take such a course need to clear its acceptability with the LING advisor at Georgia Tech.
2. A 2000-level course may be accepted by the LING advisor if its contents are based upon examples from another language, given the possible difficulty involved in having enough command of the language to deal with more complex materials.
3. Students who wish to use a course taken abroad to obtain credit towards the LING certificate must submit a copy of the syllabus of the course and petition to obtain approved form the LING advisor prior to travelling abroad.
4. Some CS and ML courses may have language prerequisites.

Certificate Information

School of Public Policy

Established in 1990

The School of Public Policy is a research intensive, globally engaged school offering BS, MS, and PhD degrees in Public Policy, an MS in Cybersecurity degree with a policy specialization, and a master's degree and stand-alone graduate certificate in Sustainable Energy and Environmental Management. Our programs appeal to students intrigued by complex problem-solving in the public interest.

The School houses one of the world's top programs in the field of science and technology (S&T) policy, and hosts a major international conference on S&T policy. It is at the center of a wide range of important international, national, and state policy questions related to the environment, information and communications technology, transportation, biotechnology and health, regional development, workforce and education. Governance of the internet, STEM education and careers, climate change policy, national and international innovation policy, economic development, risk analysis and management, renewable energy, smart growth, conflict resolution, and business-government relationships – these are a few of the topics addressed in our courses and research projects.

Our faculty members are research oriented, with more than $6 million in externally funded research underway. Our degrees are analytically oriented, developing skills increasingly in demand in the policy world as data and powerful software become more readily available and policy challenges grow more complex. The School conducts rigorous analyses of policy problems, bringing sophisticated methodologies to bear on research questions. At the same time, we are unusual among policy schools in having an active research program at the intersection of philosophy, ethics, and policy. Our location at Georgia Tech allows for a wide array of collaborative opportunities with faculty and students in science, engineering, business, computing, and city planning.

Students at all levels routinely become involved in research, from undergraduate students helping on faculty research projects or pursuing their own questions, to the opportunities our Master's degree and PhD students have to present or publish their work in scholarly settings. Internships in Atlanta, Washington, and other locales allow students to explore their interests in the public, nonprofit, and business sectors.

Public Policy students are taught by award-winning teachers. They experience policy development in internships, research projects, and capstone projects that use our location in Atlanta as a source of real-world policy problems and contacts. There are numerous opportunities for national and international engagement, with research conducted jointly with partners around the world, by internationally oriented faculty and students, and with opportunities for international exchange in undergraduate and graduate programs. We offer a unique and forward-looking environment.

Minors

- Minor in Public Policy
- Minor in Health, Medicine, and Society
- Minor in Law, Science, and Technology
- Minor in Leadership Studies
- Minor in Philosophy
- Minor in Political Science
- Minor in Women, Science, and Technology

Bachelor's Degree

- Bachelor of Science in Public Policy

Graduate Stand-Alone Certificate

- Certificate in Sustainable Energy and Environmental Management

Master's Degree

- Dual Degree - MCRP/Master of Science in Public Policy
- Master of Science in Public Polic
- Master of Science in Cybersecurity - Policy Track
- Master of Sustainable Energy and Environmental Management

Doctoral Degrees

- Doctor of Philosophy with a Major in Public Policy
- Doctor of Philosophy with a Major in Public Policy (Joint Degree with Georgia State University)

Pre-law Certificate

The School of Public Policy is home to Georgia Tech's Law, Science, and Technology/Pre-Law Program. This program offers a wide range of curricular opportunities as well as pre-law advising and support services for students considering law school and careers in law.

The program introduces students to selected areas of law that they are likely to study in law school. Students will begin to develop the skills that they will need to succeed in law school and in law practice. Some of the courses are taught by full-time faculty, while others are taught by

attorneys from the Atlanta area, thereby exposing students to academic and practical perspectives on the practice of law.

The program welcomes students from every college and major. Students majoring in the sciences and engineering may be surprised to learn that their undergraduate background gives them a strong start toward specializations such as intellectual property law, products liability law, and construction law. The pre-law program can supplement a student's scientific or engineering background by developing the reading and writing skills that are fundamental to a successful legal career.

Program of Study

Code	Title	Credit Hours
Required Courses		
Select one of the following:		3
PUBP 3000	American Constitutional Issues	
PUBP 3016	Judicial Process	
PUBP 3610	Pre-Law Seminar	
PUBP 4609	Legal Practice	
Electives		
Select elective PUBP courses to fulfill 12 credit hour requirement. [1]		9
Total Credit Hours		**12**

[1] See Pre-Law website for list of approved electives options.

For additional curricular requirements or any other information, see the pre-law section of the website www.prelaw.gatech.edu; or contact the pre-law program director (contact information listed at website).

Intellectual Property Certificate

The School of Public Policy is home to Georgia Tech's Intellectual Property Program. This program offers a wide range of curricular opportunities as well as networking opportunities for students considering a career in intellectual property or in other areas where knowledge of intellectual property would be helpful.

While earning the certificate, students will have the opportunity to learn about the protections and the limits on those protections of intellectual property: including patents, copyrights, trademarks and other forms of intellectual property. Taking an interdisciplinary approach, the certificate in IP will teach students about law, business strategies, and public policies affecting intellectual property. Some of the courses are taught by full-time faculty, while others are taught by attorneys from the Atlanta area, thereby exposing students to academic and practical perspectives on the practice of law.

Program of Study

Code	Title	Credit Hours
Required Courses		
PUBP 4640	Technology Law, Policy, and Management	3
Electives		
Select elective courses to fulfill 12 hour requirement. [1]		9
Total Credit Hours		**12**

[1] See Intellectual Property for approved elective options.

For additional curricular requirements or any other information, see the Intellectual Property section of the School of Public Policy web site at https://spp.gatech.edu/undergraduate/certificates/intellectual-property; or contact the Intellectual Property program director (contact information listed at website).

Graduate Study in Public Policy

Graduate Stand-Alone Certificate

- Certificate in Sustainable Energy and Environmental Management

Master's Degree

- Dual Degree - MCRP/Master of Science in Public Policy
- Master of Science in Public Policy
- Master of Science in Cybersecurity - Policy Track
- Master of Sustainable Energy and Environmental Management

Doctoral Degrees

- Doctor of Philosophy with a Major in Public Policy
- Doctor of Philosophy with a Major in Public Policy (Joint Degree with Georgia State University)

Graduate Certificate in Public Policy

The School of Public Policy offers a certificate in public policy to PhD students from other Schools around campus. The goal of the certificate program is to provide a basic but well-rounded introduction to public policy thinking to Georgia Tech graduate students. The program is designed to address the needs of scientists, engineers, management scholars and others who seek to be more aware of policy, regulatory, ethical, and societal implications of science, technology and innovation. The program will provide breadth and context for those entering employment in any sector. The courses in the program explore the processes through which policy is made.

Although this certificate is not available to policy students, the courses are open to all graduate students, creating an opportunity for students to gain value from divergent perspectives. Students who complete this certificate are eligible to participate in the School's PRIME international graduate student exchange program.

Eligibility

Graduate students from all programs may take the courses offered as part of this certificate. The certificate will be awarded by the School of Public Policy to any non-public policy graduate student who successfully complete the program requirements and earns a graduate degree from one of Georgia Tech's degree granting academic units. The requirements for the Graduate Certificate in Public Policy will typically satisfy the minor requirements for the Georgia Tech PhD degree.

Please contact Diana Hicks at dhicks@gatech.edu with any questions.

Certificate Requirements

Students are required to earn at least a B in every course that counts toward the certificate. The credit requirements for the Certificate in Public Policy are 12 credit hours.

Code	Title	Credit Hours
Required course		
PUBP 6012	Fundamentals of Policy Processes	3
or PUBP 62	Public Policy Analysis	
Electives		
Electives [1]		9
Total Credit Hours		**12**

[1] Three electives are required for the certificate. These electives can be chosen from the list below or from graduate-level special topics offered by the public policy faculty with the agreement of the certificate advisor. The electives are organized by broad area of interest to guide students in choosing electives that best suits their interests. Students are not required to choose all electives from the same grouping.

Analytical Methods

Code	Title	Credit Hours
PUBP 6112	Research Design in Policy Science	3
PUBP 6114	Applied Policy Methods and Data Analysis	3

Economic Development

Code	Title	Credit Hours
PUBP 6602	Economic Development Analysis and Practice	3
PUBP 6606	Urban Development Policy	3
PUBP 6415	Technology, Regions, and Policy	3
PUBP 6600	Foundations of Local Economic Development Planning and Policy	3
PUBP 6740	Innovation, the State and Industrial Development in International Perspecitve	3
PUBP 6741	Geography of Innovation	3

Economics for Public Policy

Code	Title	Credit Hours
PUBP 6116	Microeconomics for Policy Analysis	3
PUBP 6118	Public Finance Policy	3

Ethics and Values

Code	Title	Credit Hours
PUBP 6010	Ethics, Epistemology, and Public Policy	3
PUBP 6326	Environmental Values and Policy Goals	3

Environmental & Energy Policy

Code	Title	Credit Hours
PUBP 6310	Environmental Issues	3
PUBP 6312	Economics of Environmental Policy	3
PUBP 6314	Policy Tools for Environmental Management	3
PUBP 6326	Environmental Values and Policy Goals	3
PUBP 6327	Sustainability and Environmental Policy	3
PUBP 6701	Energy Technology Policy	3

Information Technology

Code	Title	Credit Hours
PUBP 6111	Internet and Public Policy	3
PUBP 6501	Information Policy and Management	3
PUBP 6502	Information and Communications Technology Policy	3

Public Administration

Code	Title	Credit Hours
PUBP 6014	Organization Theory	3
PUBP 6017	Public Management	3
PUBP 6018	Policy Implementation and Administration	3
PUBP 6226	Business and Government	3

Science and Technology Policy

Code	Title	Credit Hours
PUBP 6401	Science, Technology, and Public Policy	3
PUBP 6402	Research Policy and Management	3
PUBP 6403	Scientific Careers and Workplaces	3
PUBP 6417	Critical Perspectives on Science and Technology	3
PUBP 6440	Science, Technology, and Regulation	3
PUBP 6753	Comparative Science and Technology Policy	3
PUBP 8803	Special Topics [1]	3

[1] PUBP 8803 in public policy. See Oscar catalog for offerings in upcoming semesters. Selection of other courses requires approval of the instructor and the certificate advisor.

Public Policy Graduate Certificate

Graduate Certificate in Science, Technology and Society

The Science, Technology and Society Graduate Certificate is designed for students already enrolled in a graduate degree program at Georgia Tech. This certificate is for graduate students who would like to demonstrate additional competence in some aspect of STS or special competence in STS in their home discipline. The certificate is open to students in good standing in any graduate program at Georgia Tech.

The 12-credit hour certificate program helps students to:

- Understand the social, cultural, and epistemic dynamics of science and technology
- Explore these dynamics across world societies and cultures
- Develop sensitivity to issues of gender, race, and justice across areas of knowledge, including: engineering, medicine, environment, cognition, security, innovation, design
- Employ STS approaches as scholars or practitioners (e.g. engineers, scientists, or policy makers)

Program of Study

4 Courses Total

Code	Title	Credit Hours
Core Course		
HTS/PUBP/LMC 6743	Science, Technology & Soceity: Core Seminar	3
Select one of the following:		3
HTS 6118	Science, Technology and the Economy	
HTS 6121/INTA 8803	Science, Technology, and National Security	
HTS 6123/LMC 8803	Social and Cultural Studies of Biomedicine	
HTS 6124	Science and Technology Beyond Borders	
PUBP/LMC 6748	Social Justice, Critical Theory, and Philosophy of Design	
LMC/PUBP 6749	Feminist Theory and STS	
Elective		
Elective [1]		3
Total Credit Hours		**9**

[1] Select up to one other elective, subject to student interest and STS Coordinator approval. Many appropriate courses are offered across the Ivan Allen College and the Institute, for example: CS 8893.

Undergraduate Study in Public Policy

Minors

- Minor in Public Policy
- Minor in Health, Medicine, and Society
- Minor in Law, Science, and Technology/Pre-Law
- Minor in Leadership Studies
- Minor in Philosophy
- Minor in Political Science
- Minor in Women, Science, and Technology

Bachelor's Degree

- Bachelor of Science in Public Policy

The School of Public Policy offers undergraduate certificates and minors in five areas:

- **Public Policy**: featuring courses on government and business decision processes, especially those involving science, technology, environment, or regional development.
- **Law, Science, and Technology/Pre-Law**: preparing students to make informed decisions about law school and careers in law through selected courses in public policy, business administration, international affairs, history, and other fields.
- **Leadership studies**: providing students with an in-depth knowledge of leadership theory, skills, experience, and application through a rigorous program of study that is multi-disciplinary in nature
- **Philosophy:** providing broad perspectives and critical thinking about science and technology, emphasizing values and ethics.
- **Political Science:** focusing on how government works, from the local to the national level.
- **Women, Science, and Technology**: Links science and technology issues with those issues associated with the study of women and gender in society.

The certificates enrich any Georgia Tech degree and particularly serve students who are planning graduate studies in law, medicine, business, or the social sciences. All the certificates require a minimum of twelve semester hours of concentration.

Minors are for students wishing a concentration outside their major that provides greater depth than the certificate programs. Each minor requires a minimum of fifteen hours of credit (twelve semester hours at the 3000 level or higher with a **C** or better in each. Completion of a minor will be recognized on the student's final university transcript.

Students interested in planning a certificate or minor program in one of the five areas should contact the School of Public Policy for further information. A faculty advisor assists each student in planning a program of study to meet their needs and interests.

Minor Program of Study & Guidelines

The Sam Nunn School of International Affairs

The Sam Nunn School of International Affairs draws on its unique setting at one of the world's premier institutes of technology and the unparalleled integrity and insight of former Senator Sam Nunn. It delivers innovative programs and cutting-edge research by integrating technology and science with the study of international affairs.

At a time of rapid change, the School is dedicated to public outreach that provides a greater understanding of factors that shape the world in which we live and work. The School strives to connect learning and experience through its interdisciplinary degree programs, policy-relevant research with a strong theoretical foundation, and regular interaction with practitioners. Over the last several years, the School has introduced a series of one-year MS degrees, inter-disciplinary graduate certificates (with Aerospace Engineering, Nuclear Engineering, School of City and Regional Planning, and Economics), and undergraduate minor in Global Develop to complement long-standing BS, MS, and PhD degree programs in International Affairs.

Founded in 1990, the School enrolls undergraduate students in three bachelor's degrees, three minors, and five certificate programs. It also matriculates graduate students in its three master's degrees, doctoral program, and three certificates. What makes the Nunn School unique is that it awards bachelor of science and master of science degrees, which means our courses integrates topics in science and technology with international affairs.

Twenty-three full-time faculty members, eight distinguished professors of the practice, five lecturers, and one postdoctoral fellow teach and research a broad array of topics. Several Nunn School faculty are jointly appointed to the College of Computing (including new School of Cybersecurity & Privacy) and School of City and Regional Planning, and there are courtesy faculty appointments from the Schools of Civil and Mechanical Engineering. School faculty also direct Global Social Change Entrepreneurship VIPs, Military Fellows Program, and the Freshman Program at GT Lorraine.

Faculty research addresses the drivers and the consequences of global challenges and opportunities using qualitative/quantitative methods,

visual analytical tools, and regional perspectives. Core areas of synergy between faculty research, teaching, and practical outreach include:

- International Security: exploring the drivers and consequences of emerging technologies for issues related to conflict, cooperation, and governance in international security
- Global Development: assessing topics in sustainability, environmental issues, global energy, political economy, and international economic governance/regulation
- International Affairs, Science, and Technology: examining space, national and strategic/military innovation, comparative economic competitiveness and regulation, international financial technology and institutions, and assorted topics related to global governance and ethics.

The School offers overseas programs in Europe, Asia, and Latin America and a variety of outreach programs, including the Sam Nunn Bank of America Policy Forum. The School also houses the Center for International Strategy, Technology, and Policy and Center for European Studies—two policy-relevant, action-oriented research centers.

Minors

- Minor in International Affairs
- Minor in Global Development
- Minor in European Studies

Bachelor's Degrees

- Bachelor of Science in Economics and International Affairs
- Bachelor of Science in International Affairs
- Bachelor of Science in International Affairs and Modern Language

Master's Degree

- Master of Science in International Affairs
- Master of Science in International Security
- Master of Science in International Affairs, Science, and Technology

Doctoral Degree

- Doctor of Philosophy with a Major in International Affairs, Science, and Technology

Graduate Study in International Affairs

Master's Degree

- Master of Science in International Affairs
- Master of Science in International Security
- Master of Science in International Affairs, Science and Technology

Doctoral Degree

- Doctor of Philosophy with a Major in International Affairs, Science, and Technology

Stand-Alone Graduate-level Certificates

- Global Development
- International Security and Aerospace Systems

Graduate Certificate in Science, Technology, and Society

The Science, Technology and Society Graduate Certificate is designed for students already enrolled in a graduate degree program at Georgia Tech. This certificate is for graduate students who would like to demonstrate additional competence in some aspect of STS or special competence in STS in their home discipline. The certificate is open to students in good standing in any graduate program at Georgia Tech.

The 12-credit certificate program helps students to:

- Understand the social, cultural, and epistemic dynamics of science and technology
- Explore these dynamics across world societies and cultures
- Develop sensitivity to issues of gender, race, and justice across areas of knowledge, including: engineering, medicine, environment, cognition, security, innovation, design
- Employ STS approaches as scholars or practitioners (e.g. engineers, scientists, or policy makers)

Program of Study

4 Courses Total

Code	Title	Credit Hours
Required Courses		
Select one of the following:		3
HTS/PUBP/LMC 6743	Science, Technology & Soceity: Core Seminar	
HTS 6118	Science, Technology and the Economy	
HTS 6121/ INTA 8803	Science, Technology, and National Security	
HTS 6123/ LMC 8803	Social and Cultural Studies of Biomedicine	
HTS 6124	Science and Technology Beyond Borders	
PUBP/LMC 6748	Social Justice, Critical Theory, and Philosophy of Design	
LMC/PUBP 6749	Feminist Theory and STS	
Elective		
Elective		3
Total Credit Hours		**6**

[1] Select up to one other elective, subject to student interest and STS Coordinator approval. Many appropriate courses are offered across the Ivan Allen College and the Institute, for example: CS 8893.

Undergraduate Study in International Affairs

Minors

- Minor in International Affairs
- Minor in Global Development
- Minor in European Studies

Bachelor's Degrees

- Bachelor of Science in Economics and International Affairs
- Bachelor of Science in International Affairs
- Bachelor of Science in International Affairs and Modern Language

Graduate Course Option

Under the Graduate Course Option, undergraduate students with a final grade-point average of 3.5 or higher may count six hours of their graduate credits completed at the undergraduate level toward a master's degree at Georgia Tech in the same field. This applies to EIA, IAML, and INTA majors. This means that qualified students could complete the Master of Science in International Affairs with thirty-six additional credit hours rather than forty-two credit hours if completed within two years of earning a bachelor's degree.

BS/MS International Affairs

The Sam Nunn School of International Affairs offers a BS/MS program for students enrolled in the International Affairs, International Affairs and Modern Language, or Economics and International Affairs undergraduate programs who demonstrate an interest in and ability for additional education beyond the BS degree.

Students in the BS/MS program will remain undergraduates until they meet requirements for the undergraduate degree, at which point they will receive their BS degree and be changed to graduate status. Students will be eligible to apply for the program after completion of 45 semester credit hours at Georgia Tech (i.e., at the end of their third semester), and if they show appropriate progress in their degree program thereafter. Any student in good standing in the BS INTA, BS IAML, or BS EIA program is eligible to apply to the program. Admissions decisions will be based on GPA and judgments of the faculty who have served as advisors or instructors. Continuation in the program will require the student to maintain a GPA of 3.5 or higher in Ivan Allen College courses. The program will not penalize students who opt out after the bachelor's degree. Students participating in this program will be eligible for the six-semester credit-hour Graduate Course Option, which allows students completing both the bachelor's and master's in the same discipline to use up to 6 credit hours of graduate-level coursework in the major discipline for both degrees.

Contact the BS/MS program director for further information. https://inta.gatech.edu/programs/graduate/five-year-bsms-inta

The Sam Nunn School, often in conjunction with other units of the Ivan Allen College, administers five certificate programs. These programs enable students to pursue a focused program of study in a specific area of regional/international specialization. The School awards the following certificates:

- Asian Affairs Certificate (available to majors and non-majors)
- Latin American Affairs Certificate (available to majors and non-majors)
- European Affairs Certificate (available to majors and non-majors)
- International Affairs Certificate (available only to non-majors)
- Scenarios, Modeling and Military Games (available to majors and non-majors)

A certificate is awarded upon successful completion of a predetermined 12 credit hour cluster of courses approved by the academic advisor or a specific faculty member. All courses must be taken on a letter-grade basis, and a **C** or better must be received in each course. Certificates will be granted only to students who, in addition to the Certificate program requirements, have satisfied requirements for an undergraduate degree. Detailed information concerning these programs and their requirements is available through the School.

Scheller College of Business

Established in 1912 as the School of Commerce, the school now known as the Scheller College of Business has a distinguished history as a part of a world-renowned technical research university. Scheller College of Business offers a full range of undergraduate and graduate programs. The undergraduate program in business administration leads to the Bachelor of Science in Business Administration degree. The College also offers several Master's degree programs:

- the Master of Business Administration (MBA), which can be completed in two years as a full-time program or in two to three years as a part-time evening program;
- the Master of Business Administration in Management of Technology, which is offered in a weekend format and can be completed in less than two years;
- the Master of Business Administration in Global Business, which is offered in a weekend format and can be completed in less than two years;
- the Master of Science in Analytics;
- the Master of Science in Quantitative and Computational Finance; and
- an undesignated Master of Science degree.

The College also offers a doctoral program that leads to a PhD in Management.

Students admitted to the graduate programs are admitted only on a degree-seeking basis. The College is accredited by the Association to Advance Collegiate Schools of Business (AACSB) International.

Scheller College is a recognized leader in developing business leaders to succeed in today's high-tech business world. Programs combine excellence in the functional areas of business education with the multidisciplinary focus on management of technology, international business, and entrepreneurial and innovative processes for a global economy. Students learn to create value that will make a social and economic difference in the lives of individuals, groups, communities, and societies. With a curriculum that emphasizes collaborative learning based on real-world experience, the College offers the resources of centers focusing on business analytics, sustainability, leadership, and entrepreneurship to foster research, teaching excellence, and discussion across the major functional areas of business.

The College of Business and all of its degrees are accredited by the Association to Advance Collegiate Schools of Business (AACSB) International.

Minors

- Minor in Computing and Business
- Minor in Engineering and Business

- Minor in Technology and Business
- Minor in Leadership Studies

Bachelor's Degree

- Bachelor of Science in Business Administration

Master's Degree

- Master of Business Administration
- Master of Science in Analytics
- Master of Science in Quantitative and Computational Finance
- Master of Business Administration in Global Business - Executive
- Master of Business Administration in Management of Technology - Executive
- Master of Science with a Major in Management

Doctoral Degrees

- Doctor of Philosophy with a Major in Management

Graduate Study in Business

Master's Degree

- Master of Business Administration
- Master of Science in Analytics
- Master of Science in Quantitative and Computational Finance
- Master of Business Administration in Global Business - Executive
- Master of Business Administration in Management of Technology - Executive
- Master of Science with a Major in Management - Executive

Doctoral Degrees

- Doctor of Philosophy with a Major in Management

Undergraduate Study in Business

Minors

- Minor in Computing and Business
- Minor in Engineering and Business
- Minor in Leadership Studies
- Technology and Business

Bachelor's Degree

- Bachelor of Science in Business Administration

Transfer Credit Policy for Undergraduate Students

Students may transfer business and management courses taken at another accredited institution if the courses are passed with a "C" or better and are deemed by the College of Business to be equivalent to a Georgia Tech course. Such courses will be transferred for the same number of credits as the corresponding College of Business courses, provided they are equal to three or more semester hours of credit. Transfer credits will be accepted from newly-formed institutions of the University System of Georgia prior to accreditation.

Junior- or senior-level courses with three or more semester hours of credit that have no corresponding College of Business course may transfer as electives in management if they are approved by the College of Business.

Because of the difference in the intellectual level of various courses, freshman- or sophomore-level courses taken at other institutions may only be transferred for equivalent freshman- or sophomore-level courses offered at Georgia Tech. Before taking courses at other institutions, students should refer to the Georgia Tech transfer credit policies at www.registrar.gatech.edu/students/transfercredit.php. Business students considering taking courses at other institutions should keep in mind Georgia Tech's 36-hour Residency Rule, which states that "no student may be considered a candidate for a degree unless the final 36 credit hours required for the degree are earned in residence at Georgia Tech and approved by the major school."

In addition to its degree programs, the College of Business offers students in good standing an opportunity to broaden their areas of expertise or acquire skills or information beyond their major degree requirements. Students who satisfactorily complete this special program will receive a certificate of recognition. Certificates are only available to degree-seeking Georgia Tech undergraduates. Certificates are awarded upon graduation from a Georgia Tech undergraduate program. For certificate requirements, please see the College of Business Website: www.scheller.gatech.edu

The following certificate programs are available for undergraduate students:

- Accounting
- Business Analytics
- Business Law and Ethics
- Entrepreneurship
- Finance
- Information Technology Management
- International Business
- Leadership and Organizational Change
- Marketing
- Operations and Supply Chain Management
- Strategy and Innovation
- Sustainable Business

ACADEMICS

- Academic Resources
- Colleges and Schools
- Courses
- Distance Learning and International Sites
- Graduate Academics
- Professional Education
- Programs
- Research Support Facilities
- Special Academic Programs
- Undergraduate Academics
- Undergraduate Minors

Academic Resources

Programs & Services

- Academic Advising
- Academic Resources
- Career Services
- Counseling
- Dean of Students
- Dining Services
- Diversity Programs
- Fellowships
- Freshman Experience Program
- Health Services
- International Student Services
- LGBTQIA Resource Center
- Office of Minority Educational Development
- Orientation (new students)
- Tutoring & Workshops
- Women's Resource Center
- Veteran's Resource Center

Departments

- Admissions (undergraduate)
- Admissions (graduate)
- Alumni Association
- Athletic Association
- Bursar's Office
- Office of the Vice President for Student Life and Dean of Students
- Center for Career Discovery and Development
- Financial Aid
- Housing
- Parking and Transportation
- Police (campus)
- Registrar's Office

Student Life

- Leadership & Civic Engagement
- Greek Affairs
- Student Government
- DramaTech

Facilities

- Campus Recreation Center
- Information Technology
- Library & Information Center
- Interdisciplinary Research Centers
- Ferst Center
- Student Center

Colleges and Schools

- College of Computing
- College of Design
- College of Engineering
- College of Sciences
- Ivan Allen College of Liberal Arts
- Scheller College of Business

Courses

- All Courses
- Graduate-Level Courses
- Undergraduate-Level Courses

Distance Learning and International Sites

Academic content delivered through distance learning is in accordance with the course descriptions as approved by the Institute Curriculum Committee. All courses require approval by the Institute Curriculum Committee and the Academic Senate. All offerings for academic credit delivered through the Division of Professional Education have been approved in this manner.

Academic content delivered at our international sites, such as GT-Europe and GT-Shenzhen, is in accordance with the course descriptions as approved by the Institute Curriculum Committee. All courses require approval by the Institute Curriculum Committee and the Academic Senate regardless of where they are delivered. All Study Abroad Programs are approved on a yearly basis by the Institute Undergraduate Curriculum Committee as recommended by the Study Abroad Subcommittee.

Graduate Academics

The faculty of Georgia Tech grants advanced degrees in engineering, science, business, computing, architecture, city and regional planning, public policy, and other technology-related areas. The goals for graduate studies and research are to establish an educational environment that will strengthen students' personal and professional development, to encourage students and faculty to pursue the discovery and generation of new knowledge through research, to investigate ways of applying such knowledge for the benefit of society and humanity, and to foster the development of new tools, objects, and ideas.

Students whose interests and aptitudes lead them beyond the limits of the traditional undergraduate curriculum may broaden their knowledge

of a given field and pursue independent inquiry through graduate study. A graduate education is of particular benefit to students interested in careers in research, management, development, design, or consulting; to those who aspire to formulate and administer policy; and to those who desire careers in higher education.

- Doctoral Degree Programs
- Graduate Policies and Regulations
- Graduate Student Work Loads
- Graduate Student-Advisor Expectations
- Guidelines for Teaching and Professional Experience
- Master's Degree Programs
- Requirements for the Doctoral Degree
- Requirements for the Master's Degree
- Thesis and Dissertation Policy

Graduate Policies and Regulations

The Institute Graduate Curriculum Committee, with the approval of the Academic Faculty Senate, is responsible for establishing academic policy for the graduate programs; however, final authority rests with the Senate. This committee reserves the right to change requirements for degrees as may be appropriate. Students enrolled at the time such changes appear in the Catalog have the privilege of following either the requirements stated in the Catalog effective the semester in which they enrolled or the requirements in the Catalog that records the change.

This catalog records the institute-wide policies and regulations that govern the graduate programs. Schools may make additional rules concerning their programs and the pursuit of their degrees, but such rules may not contradict Institute policies and regulations.

Transfer Credit

A student may not apply for transfer credit until after matriculation at Georgia Tech. The courses to be transferred would typically be those appearing on the approved program of study form for the masters degree. A doctoral student normally does not request transfer credit. The rules relative to and the process for obtaining transfer of credit for graduate-level courses are as follows:

1. Student's in a master's degree program requiring fewer than 33 semester credit hours may receive up to six hours of transfer credit for graduate-level courses taken at an institution accredited by a Canadian or U.S. regional accrediting board, or at a foreign school or university that has a signed partner agreement with Georgia Tech, and not used for credit toward another degree. This ensures completion of at least one-third of the courses for a degree in residence at Georgia Tech (applies to programs that are face-to-face and online format). A student in a master's degree program requiring 33 semester credit hours or more may receive up to nine hours of transfer credit for graduate-level courses taken at an institution accredited by a Canadian or U.S. regional accrediting board, or at a foreign school or university that has a signed partner agreement with Georgia Tech, and not used for credit toward another degree. This ensures completion of at least one-third of the courses for a degree in residence at Georgia Tech (applies to programs that are face-to-face and online format).The student must supply a current transcript for this evaluation.
2. To obtain transfer of credit, the student must complete the following procedure:
   a. The student will confer with the graduate advisor to ascertain whether the courses to be transferred are a logical part of the student's graduate program;
   b. If the courses are appropriate, the student will deliver to the school that teaches such courses a copy of the current transcript, necessary descriptive materials including catalog descriptions, and textbooks used for evaluation. The faculty of the appropriate school will determine the equivalent Georgia Tech course and the number of credit hours accepted. The faculty member who prepares the transfer credit form (i.e., the Non-Resident Credit Report) should have the school chair cosign it. The school should then send the form directly to the registrar with a copy of the student's Approved Program of Study attached;
   c. If the student wishes to transfer more than the number of hours permitted in item one listed above, a petition must be submitted to the Institute Graduate Curriculum Committee that includes statements of possible justification for the granting of such a petition, transfer credit forms, and the recommendation of the student's school chair.
3. A joint enrollment student may receive graduate credit for up to one-third of the hours required for the degree for graduate courses taken at Emory University or Georgia State University provided that the following is true:
   a. Georgia Tech does not offer such courses;
   b. The student's advisor and school chair approve the courses in advance and in writing;
   c. The student passes the courses with a **C** or better. Advance approval is satisfied when the courses appear on the student's proposed Program of Study.
4. A student may not receive transfer credit from universities outside the United States and Canada unless the courses were taken at a foreign institution or university that is accredited by a Canadian or U.S. regional accrediting board or has a signed partner agreement with Georgia Tech. In any other case, an international student can obtain credit for courses previously taken but not applied toward another degree by filling out an Examination for Advanced Standing Authorization Request Form, paying the appropriate fee at the Bursar's Office, and passing the examination for advanced standing. The school or college that normally teaches the equivalent course will administer any necessary examinations.

Double Counting Credit between Master's Degrees

Students who are pursuing two Master's degrees at Georgia Tech may double count a maximum of 6 hours of credit for both degrees. This ensures that each degree involves a minimum of 24 hours of coursework completed at Tech that is not double counted.

The six-hour limit may be exceeded when specifically allowed as a component of an approved degree program.

Staff Members

No staff member beyond the rank of instructor in a school may work for a master's degree in that school. No new staff member with the rank of assistant professor in a school may work for a doctoral degree in that school.

General

A student who wishes to withdraw their name from the rolls of degree candidates must formally withdraw the Online Application for Graduation before the end of the seventh week of the semester (or fourth week of the summer term). This privilege will be extended to a degree candidate only once.

Graduate Student Work Loads

Full-time students must be enrolled for at least 12 credit hours on a letter grade or pass/fail basis. As an exception, the advisor and school chair may allow up to three hours out of the minimum 12 to be taken on an audit basis in fall and spring semesters; in summer semesters, the advisor and school chair may allow up to six hours out of the 12 minimum to be taken on an audit basis. (This exception is not applicable for students on immigrant visas or certain fellowships requiring them to enroll in at least 12 credit hours on a letter grade or Pass/Fail basis each academic term.) Hours in excess of the required 12 may be taken on any basis. Full-time students working exclusively on thesis research should be registered for 18 or more hours of 7000 or 9000 level courses (master's or doctoral thesis courses) in fall and spring semesters, and for up to 16 hours during summer semesters.

The maximum load for graduate students in good standing is 21 hours in fall/spring and 16 hours in summer. The minimum load is three hours, except for the semester of graduation. During the semester of graduation, a student is permitted to register for only one hour of master's or doctoral thesis courses (7000 or 9000). This exception may be used only once for each degree.

Students with fellowships, graduate research or teaching assistantships, traineeships, tuition waivers, or student visas, and those assigned to the Institute by the armed forces for the purpose of pursuing a degree are required to enroll full time. Part-time doctoral students engaged in research for their Ph.D.s should meet the minimum enrollment requirement and register for the number of 9000 level hours consistent with the time they and their faculty advisors spend on the dissertation research.

Requirements for the Doctoral Degree

The Doctoral Degree
Admission to Candidacy
Comprehensive Exams
Thesis Topic
Time Limit for Degree Completion
Dissertation
Doctoral Examination
Minor Field of Study
Other Requirements
Enrollment Requirements
Additional Graduation Requirements
Responsible Conduct for Research (RCR)

The Doctoral Degree

The degree of Doctor of Philosophy recognizes demonstrated proficiency and high achievement in research. After adequate preparation, the candidate must successfully complete both comprehensive examinations in their academic field and a searching and authoritative investigation of a special area in the chosen field, culminating in a written dissertation. The program of study for each doctoral degree program must include, at a minimum, 30 approved credit hours.

Admission to Candidacy

Doctoral students customarily apply for degree candidacy after completing at least three semesters of coursework beyond the bachelor's degree.

To qualify for candidacy, students must do the following:

1. Complete the requirements for training in Responsible Conduct for Research (RCR).
2. Complete all course requirements (except the minor).
3. Achieve a satisfactory scholastic record.
4. Pass the comprehensive examination.
5. Submit a formal statement naming the dissertation reading committee and delineating the research topic for approval to the school chair and Graduate Education (on behalf of the Vice Provost for Graduate and Postdoctoral Education).

Upon satisfactory completion of these requirements, the Office of Graduate Education will formally admit the applicant to candidacy for the degree on behalf of the Vice Provost for Graduate Education and Faculty Development.

Comprehensive Exams

The comprehensive examination assesses both general knowledge of the degree area and specialized knowledge of the student's chosen research field. Each program is responsible for scheduling comprehensive examinations at least once a year and for providing students information regarding exam formats, rules, and scope. Exam retakes are to occur no later than the end of the student's second full term (Fall, Spring, or Summer) in residence following the failed attempt.

Thesis Topic

Before a student becomes a candidate, they should present a formal statement for the approval of the school chair or college dean and Graduate Education that outlines the student's dissertation advisor, the topic selected for investigation, the objectives, and the steps by which the student proposes to achieve them. (Note that individual programs may have additional requirements for approving the dissertation prospectus or proposal before approval by the chair/dean and Graduate Education.) The dissertation topic must give promise of being either a genuine addition to the fundamental knowledge of the field or a new and better interpretation of facts already known.

Time Limit for Degree Completion

Students must complete all degree requirements within seven years from the end of the term in which they pass the comprehensive examination.

Dissertation

The dissertation must demonstrate that the candidate possesses powers of original thought, talent for research, and ability to organize and present findings. Resources such as the Thesis and Dissertation Manual, deadlines, checklist, and templates are found in the Thesis & Dissertation website. Dissertations must be submitted electronically via the Electronic Thesis and Dissertation link available on that resource site.

The format of the dissertation (in general appearance) must meet the criteria published in the Thesis and Dissertation Manual. For other format

or style questions, students should refer to style manuals appropriate to their disciplines.

Doctoral Examination

If the dissertation advisory committee finds the dissertation satisfactory, it schedules the candidate for an oral examination on the subject matter of the dissertation and the field in which it lies. An examining committee approved by Graduate Studies on behalf of the Vice Provost for Graduate and Postdoctoral Education will conduct the examination. The candidate's academic unit should forward the announcement of the oral examination, including the names of the examining committee members, to Graduate Education at least 10 working days prior to the exam.

If a candidate should fail to pass the final oral examination, the examining committee may recommend permission for one additional examination. In the case of failure, the Registrar does not receive a report of the examination results.

Minor Field of Study

In addition to an adequate knowledge of the major field of intended research, the student must demonstrate mastery of another smaller body of knowledge—the minor field—preferably outside the student's school. The purpose of the minor is to encourage a wider interest on the part of the student and can include topics that will help them in their research or those that will allow them to explore and prepare for their future careers.

The minor will normally consist of at least six semester hours of work in related courses, selected by the student in consultation with a guidance committee and approved by the Graduate Education (on behalf of the Vice Provost for Graduate and Postdoctoral Education). These courses should be at the 6000 level or above, but the use of certain 4000 level courses may also be approved. The student must receive a letter grade of C or higher for a course to count towards the doctoral minor. (Courses that are taken as pass/fail are not eligible to count toward the doctoral minor). Courses taken at other institutions may be included in the minor. Once the student has satisfactorily completed the minor, the school chair will send a confirmation, accompanied by course grades, to Graduate Studies for final approval and recording.

Although the student need not complete the minor as a prerequisite to become a candidate, the minor must be completed and approved in order to be cleared for graduation.

Other Requirements

Enrollment Requirements

The matriculation requirements for doctoral students are similar to those outlined for the master's degree with the addition of the residency requirement: doctoral students should spend at least one full-time semester in residence at Georgia Tech and should conduct research for their dissertation while in residence. Under special circumstances, candidates may receive permission to pursue their research in absentia, provided the chair of the appropriate school approves and a Georgia Tech faculty member directs the project. Although doctoral students working full-time on thesis research should normally be registered for a full course load of 9000-level dissertation hours each semester, this requirement is at the discretion of the advisor and the department. No minimum number of 9000-level dissertation hours is required for the doctoral degree. Doctoral students must be registered in the semester of graduation.

If a student has completed all degree requirements and will no longer require any of the Institute's facilities or faculty time, the student may request an enrollment waiver available on the Thesis & Dissertation Forms website.

Additional Graduation Requirements

In addition to the requirements listed elsewhere, the candidate is required to complete the following:

1. Complete an Online Application for Graduation to petition for the degree to the Registrar's Office during the term preceding the anticipated final term of work.
2. Have an overall GPA of at least 3.0.
3. Register for a minimum of one hour of dissertation in the term of graduation. This reduction from the normal minimum course load of three hours may be used only once. If all requirements for graduation, including submission of the final approved dissertation, have been completed prior to the last day of registration and the student was registered for the preceding term, the student may apply for a waiver of the enrollment requirement, where the application is available on the Thesis & Dissertation Forms website.
4. Submit the dissertation to the Electronic Thesis and Dissertation website, linked from the Thesis & Dissertation website, prior to the final submission of the completed dissertation to Graduate Education.

If both the dissertation and the examination are satisfactory, and the candidate has completed the requirements of residence, minor field, and any additional school requirements, Graduate Education will certify the candidate as qualified to receive the degree of Doctor of Philosophy.

Responsible Conduct for Research (RCR)

All Georgia Tech doctoral students must complete Responsible Conduct of Research (RCR) education, which includes an online training component and a doctoral-level RCR course. All master's thesis students must also complete RCR education. For more information, see https://rcr.gatech.edu/academic-policies.

Requirements for the Master's Degree

Graduate Course Option
Enrollment Requirements
Program of Study
Master's Thesis
Requirements for the Award of the Master's Degree

Graduate Course Option

Students completing both a bachelor's and master's in the same discipline at Georgia Tech may use up to six credit hours of graduate-level coursework in the major discipline for both degrees. Recognizing that some master's degree programs do not have a unique undergraduate counterpart program and that some master's programs are offered by several schools, the term "discipline" in the prior sentence will be broadly interpreted in such cases. To qualify for this option, students must complete the undergraduate degree with a cumulative GPA of 3.5 or higher and complete the master's degree within a two-year period from the award date of the bachelor's degree.

Enrollment Requirements

While students may enroll in a master's degree program upon admission with either full or conditional standing, all conditions must be met and the student's status changed to "full" in order to graduate with a master's degree. Students enrolled in a master's degree program must register for at least one semester per year in order for the original requirements for their degree to remain unchanged. In other cases, the school may reevaluate the student's credentials and impose additional degree requirements.

Students who have completed all coursework and are planning to submit a thesis in partial fulfillment of the requirements for a master's degree should register for research hours (MAJR 7000) consistent with a realistic appraisal of the amount of remaining thesis work and required faculty involvement. Students are not eligible to receive thesis guidance during any term for which they are not registered.

Students must normally enroll for a minimum of three hours each semester. Thesis students may enroll for one hour of thesis only in the semester of graduation; this option may be used only once. The Institute has no residency requirements for the master's degree.

If a student has completed all degree requirements and will no longer require any of the Institute's facilities or faculty time, the student may request an enrollment waiver, available on the Forms website.

Program of Study

The student, in consultation with the faculty advisor, should prepare a program of study for the master's degree as a guide for planning an academic schedule. In some cases, the student's school may require that the proposed program be submitted to the chair of that school for approval.

The program of study must be completed satisfactorily within six consecutive calendar years and must include, at a minimum, 30 approved credit hours distributed as follows:

With thesis:

1. Minimum course credit hours in major field (a basic field of knowledge, not a department of specialization): 12
2. Minimum course credit hours at 6000 to 9000 level: 12
3. Minimum course credit hours for degree: 18
4. Minimum Thesis hours (7000): 6
5. Total credit hours: 30

Without thesis: (must have approval of school chair)

1. Minimum course credit hours in major field (a basic field of knowledge, not a department of specialization): 18
2. Minimum course credit hours at 6000 to 9000 level: 21
3. Total credit hours: 30

Some schools require more than the minimum credit hours. Refer to specific academic program descriptions for more detailed information.

Other than thesis hours, the student may use only three hours under the pass/fail designation in the approved program of study.

Students who are pursuing two Master's degrees at Georgia Tech may double count a maximum of 6 hours of credit for both degrees. This ensures that each degree involves a minimum of 24 hours of coursework completed at Tech that is not double counted. Students should consult with their advisors on sharing coursework among Master's degrees.

Students may be eligible to utilize the Graduate Course Option or participate in an approved BS/MS program. Students should refer to the Catalog for requirements for the Graduate Course Option and for BS/MS program requirements.

Master's Thesis

To complete the requirements for the master's degree, the student must submit a master's thesis unless the school chair determines that additional coursework is of more importance in meeting approved objectives.

Students who meet the requirements for the master's degree by completing a combination of coursework and thesis must register for a minimum of six hours of thesis credit.

A candidate whose program includes a thesis must present a treatise in which the results of an investigation directed by a member of the faculty of the Institute are set forth in a clear, articulate form. The purpose of the thesis is to further educational development by requiring the student to plan, conduct, and report an organized and systematic study of importance.

Resources for theses such as the Thesis and Dissertation Manual, deadlines, templates, checklists are found on the Thesis & Dissertation website. The Manual for Graduate Theses specifies the formatting requirements for the thesis. Information regarding electronic thesis/dissertation submission can also be found on that resources website.

Requirements for the Award of the Master's Degree

For a student to receive a master's degree from Georgia Tech, the following requirements should be met:

1. During the semester prior to the anticipated final semester of work, students should petition to graduate. This can be done by completing the Online Application for Graduation.
2. The Approved Program of Study (which is listed on the petition for degree application) should show that course requirements for the master's degree will be satisfied before or during the final semester. The Approved Program of Study should be completed within a period of no more than six consecutive calendar years.
3. Students should have an overall GPA of at least 2.70 and satisfy all school academic requirements. (Some schools may require a higher overall GPA, and some programs may have different GPA requirements for certain segments of the program requirements, such as for core classes. If so, this must be reported to the Institute Graduate Curriculum Committee through the initial proposal or as a curriculum change and will be considered an informational item on the agenda. These requirements will be enforced at graduation.)
4. Students should earn a grade of at least D on coursework for it to be considered completed. (Some individual programs may require a grade of C or higher. These requirements must be reported to the Institute Graduate Curriculum Committee either as part of the initial proposal or as part of a curriculum change and will be considered an informational item on the agenda. These requirements will be enforced at graduation.)
5. Students may take three hours on a pass/fail basis, per Institute policy. (However, individual programs may not allow pass/fail grades

at all or may restrict them to only specific portions of the degree such as electives. These restrictions must be reported to the Institute Graduate Curriculum Committee as part of the initial proposal or as part of a curriculum change and will be enforced at graduation.)

6. Students should be registered for a minimum of three credit hours at all times. However, thesis students are permitted to enroll for one hour of MAJR 7000 in the semester of graduation. This reduction may be used only once. Students who have met all requirements for graduation before the last day of registration for the graduation term and who were registered the preceding semester may be eligible for a waiver of enrollment.
7. Coursework at the 1000 or 2000 level may not be used for a master's degree. In most cases, coursework at the 3000 level may not be used for a master's degree. But individual programs may allow a reasonable number of 3000-level courses in special circumstances, such as in a program that requires language proficiency. Individual programs may include 4000-level coursework, but this must be reported to the Institute Graduate Curriculum Committee as either part of the initial proposal or clearly stated when revising a program. These rules will be enforced at graduation.
8. Students should have completed satisfactorily any language requirement imposed by the major school.
9. Thesis students must complete the requirements for training in Responsible Conduct for Research (RCR).
10. Students should have passed any qualifying or comprehensive examinations required by their school.
11. Students should have completed any required coursework outlined at the time of matriculation.
12. Students should ensure that all requirements for the degree are completed and certified by the Office of the Registrar no later than 48 hours after final grades for the term are due. If a candidate for a degree is not certified by the appropriate deadline, the degree will not be awarded. It is the responsibility of the student to reactivate the degree petition for the following semester.
13. The diploma of a candidate for a degree shall bear the date of the latest commencement ceremony for the term in which the degree is awarded with the exception of summer graduation diplomas, which will bear the date of the official end of term.

Additional Requirements for Master's Thesis Students

1. Students should submit the thesis topic and committee form to Graduate Studies for approval and make satisfactory progress on the thesis.
2. Students should complete the requirements for training in Responsible Conduct for Research (RCR).
3. Students should submit the thesis electronically to the Electronic Thesis and Dissertation link available on the Thesis & Dissertation Forms website and receive final acceptance from the Office of Graduate Education.

Language Requirement

The student's school may require a reading knowledge of one appropriate language other than English.

Professional Education

Georgia Tech Professional Education (GTPE) is the global campus and lifetime education arm of Georgia Institute of Technology.

GTPE offers professional development courses, certificate programs, and master's degrees to career-focused adults in tech, business, and industry specific subject matter to meet the needs of working professionals and industry partners. Programs are available worldwide both online and on-site.

In addition to professional academic offerings, the division administers K-12 outreach, professional certificates for active-duty service members and veterans, and an English as a Second Language program. We also offer comprehensive virtual, hybrid, and in-person professional meeting and event experiences.

On an annual basis, GTPE serves and supports more than 193,000 learners – the "hidden students" who don't live on campus but out-number those who are physically here.

While GTPE is located at the Georgia Tech Global Learning Center (GLC) and the O'Keefe building in Atlanta, and at Georgia Tech-Savannah, our programs are available worldwide through online and hybrid formats, as well as in-person at corporate, government, and third-party locations.

Learn more about Georgia Tech Professional Education at pe.gatech.edu.

Community Outreach

Workforce readiness is a top priority for Georgia Tech Professional Education (GTPE). As such, we advocate for STEM exploration to improve appreciation, diversity, and performance in STEM fields, with many of our outreach programs offered in partnership with the Center for Education Integrating Science, Mathematics, and Computing (CEISMC).

From summer camp programs to professional development for STEM educators and distance math classes, we offer programs specifically engineered to give students the tools to solve real-world problems while also taking advantage of the resources and expertise of the Georgia Tech community. By providing these opportunities to students in STEM, we are ensuring tomorrow's innovators and educators have the skills to succeed in the workplace.

To learn more about our K-12 programs, visit pe.gatech.edu/programs/k12-programs.

English as a Second Language

The mission of the Georgia Tech Language Institute (GTLI) is to empower learners to reach their full potential through improved communication skills in English. The Language Institute has delivered high-quality, practical English language instruction for more than sixty years to a wide range of learners: matriculated international students; international scholars and postdocs; students preparing for academic work in the U.S.; professionals looking for career improvement through better language skills; learners seeking an exchange experience in the U.S.; and people wanting to increase their English proficiency for social reasons.

With its full- and part-time programs offered remotely and face-to-face, the Language Institute is a center for lifelong learning in communication and cross-cultural understanding.

Course options include:

- Intensive English Program (IEP)
- Certificate Program in Cross-Cultural Communication for Professionals
- Credit and non-credit communication courses for international graduate students
- Short Courses

- Online On-Demand courses
- Customized Programs

Learn more at www.esl.gatech.edu.

Professional Education Degree Programs

For over 45 years, Georgia Tech Professional Education has delivered online learning programs to career-focused adults across the globe.

Built on Georgia Tech's rigorous on-campus programs, our 10 online Master of Science degrees and three hybrid Professional Master's degrees are designed to provide you with the STEM and leadership capabilities to be competitive in your field.

In addition to a sought-after credential from a world-renowned university, you can also expect:

- World-class faculty
- Media-rich, digital learning tools
- High quality, rigorous courses

In annual rankings from *U.S. News & World Report*, Georgia Tech graduate programs consistently rank in the top 10. The proven excellence of Georgia Tech graduate degrees and the convenience of online delivery make them a compelling choice for working professionals.

The following Master of Science degrees are available online:

- Aerospace Engineering
- Analytics
- Computational Science and Engineering
- Computer Science
- Cybersecurity
- Electrical and Computer Engineering
- Industrial Engineering
- Mechanical Engineering
- Medical Physics
- Operations Research

Learn more about the online Master of Science degrees.

The following Professional Master's degrees are available in a hybrid format:

- Applied Systems Engineering
- Manufacturing Leadership
- Occupational Safety and Health

These programs combine online learning with three week-long visits to Georgia Tech's main campus in Atlanta over the course of the two-year program. Learn more about the Professional Master's Degrees.

Professional Education Short Programs

Georgia Tech Professional Education (GTPE) offers professional development courses, certificates, and bootcamp programs to career-focused adults in STEM and business fields worldwide.

Whether you are upgrading your skill set, sharpening your expertise, or future-proofing your career, our short programs are designed to position you to deliver immediate workplace impact using knowledge and skills learned from Georgia Tech's faculty experts and each other.

We offer industry-specific courses, boot camps, and certificate programs that combine academic rigor with hands-on, practice training in demand by industry. Programs are available worldwide both online and on-site.

Programs are available in more than 15 subject areas such as data analytics, cybersecurity, defense technology, engineering, leadership, manufacturing, occupational safety and health, project management, and supply chain and logistics.

Learn more at pe.gatech.edu/programs.

Research Support Facilities

- Advanced Technology Development Center (ATDC)
- Georgia Tech Research Corporation
- Georgia Tech Research Institute
- Joint CNRS Research Laboratory
- Logistics Innovation Centers
- Oak Ridge Associated Universities
- Skidaway Institute of Oceanography
- VentureLab

Advanced Technology Development Center (ATDC)

The Advanced Technology Development Center (ATDC)

The Advanced Technology Development Center (ATDC) is the state of Georgia's technology startup incubator. Founded in 1980 by the Georgia General Assembly which funds it each year, ATDC's mission is to work with entrepreneurs in Georgia to help them learn, launch, scale, and succeed in the creation of viable, disruptive technology companies. Since its founding, ATDC has grown to become the longest running and one of the most successful university-affiliated incubators in the United States, with its graduate startup companies raising in excess of $3 billion in investment financing and generating more than $12 billion in revenue in the state of Georgia.

ATDC is headquartered in Technology Square and has space wet lab space in the Ford Environmental Science and Technology (Ford ES&T) Building. The incubator also has staff across the state via its ATDC@ program in Albany, Athens, Augusta, Columbus, Macon, Peachtree Corners, and Savannah. ATDC staff also support programming in Alpharetta, Braselton, and Sandy Springs. At these locations, early-stage companies benefit from a strong entrepreneurial working environment, access to professional business consulting, contact with Institute research faculty, and modern office and laboratory facilities. Through its ATDC Connect offering, the incubator also provides companies with access to facilities, personnel, and University System of Georgia students, fosters relationships with investors, and large corporate enterprises.

- The Advanced Technology Development Center (ATDC)

Georgia Tech Research Corporation

Founded in 1937, the Georgia Tech Research Corporation (GTRC) is a state-chartered, not-for-profit corporation serving Georgia Tech as a University System of Georgia-approved cooperative organization. By charter, GTRC "...shall be operated exclusively for scientific, literary, and educational purposes...conduct laboratories, engage in scientific research, and distribute and disseminate information resulting from research..." GTRC is an IRS section 501(c)(3) not-for-profit organization and serves as the contracting agency for all of the sponsored research activities at Georgia Tech. It also licenses all intellectual property (patents, software, trade secrets, etc.) created at Georgia Tech. Additionally, GTRC assists Georgia Tech in obtaining quality research space, enters into long-term leases for specialized research equipment, and conducts other research support programs as requested by the Institute. All funds collected by GTRC are used to support various Georgia Tech research programs requested by the Institute and as approved by the twelve-member board of trustees.

- GTRC Website
- Office of Sponsored Programs

Georgia Tech Research Institute

The Georgia Tech Research Institute (GTRI) is a globally recognized applied research and development organization. Each day, GTRI's science and engineering expertise is used to solve some of the toughest problems facing government and industry across the nation and around the globe. GTRI's world-class engineers and scientists solve some of the toughest problems facing government and industry across the nation and around the globe. For more than eighty-six years GTRI has been uniquely positioned within the Georgia Institute of Technology, one of America's top research universities.

GTRI is over 2,800 people strong, including some of the world's top scientists and engineers who conduct more than $780 million in sponsored research each year. Many of GTRI's experts are recognized worldwide as leaders in a vast array of research domains. GTRI's core research areas include complex and agile systems engineering, sensor design and integration, information management and cybersecurity, and defense technology development.

GTRI operates 15 operations units and eight research laboratories located on Georgia Tech's main campus in midtown Atlanta, and at the Cobb County Research Facility (CCRF) north of Atlanta. In addition, GTRI serves its sponsors through 21 field offices located at:

- Aberdeen, Maryland;
- Albuquerque, New Mexico;
- Colorado Springs, Colorado;
- Dayton, Ohio;
- Fort Belvoir, Virginia;
- Hampton Roads, Virginia;
- Huntsville, Alabama;
- Jacksonville, Florida;
- Lincoln, Massachusetts;
- Orlando, Florida;
- Panama City, Florida;
- Patuxent River, Maryland;
- Pearl City, Hawaii;
- Phoenix, Arizona;
- Quantico, Virginia;
- San Antonio, Texas;
- San Diego, California;
- Shalimar, Florida;
- Tucson, Arizona
- Warner Robins, Georgia; and
- Washington, District of Columbia.

One of GTRI's goals is to support economic and technological development in Georgia. GTRI promotes economic growth in the state and the southeast through mutual programs with the Georgia Tech Enterprise Innovation Institute. GTRI operates strong technology transfer programs and GTRI researchers teach more than half of all courses offered through Georgia Tech's Distance Learning and Professional Education program. The newest offering is a Professional Master's Degree in Applied Systems Engineering, which was developed jointly by GTRI and the Georgia Tech College of Engineering. GTRI is also home to the state's Agricultural Research Technology Program, which conducts research and technology transfer for the poultry industry, one of Georgia's leading industries and employers.

For additional information, contact the

Office of the Vice President, Georgia Institute of Technology and Director of Georgia Tech Research Institute
GTRI
250 14th Street
Atlanta, Georgia 30332-0801
or call 404.407.7400, or
visit www.gtri.gatech.edu.

Joint CNRS Research Laboratory

As the result of a strategic alliance between the Georgia Institute of Technology and the French Centre National de la Recherche Scientifique (CNRS), a joint research laboratory, GT-CNRS UMI 2958 was established at Georgia Tech-Lorraine in March of 2006. The laboratory conducts a unique transatlantic collaborative program of research in secure networks and smart materials. Research faculty and graduate students from Georgia Tech, French universities, and other CNRS laboratories work on joint research projects sponsored by industry and by local and national governments.

More information is available by visiting the CNRS web site or by contacting Dr. Abdallah Ougazzaden, Director UMI 2958, at +33 387.20.3939.

- Georgia Tech-Europe

Logistics Innovation Centers

Due to an increasing need for the comprehensive examination of trade-chains and in light of the success of the Supply Chain and Logistics Institute in partnering with the National University of Singapore and various agencies of the government of Singapore, a global network of Trade-chain Innovation & Production (TIP) Centers has developed. This network of centers enables a comprehensive program focused on (1) developing insights, strategies, and methodologies to improve the productivity of existing trade-chains, (2) promoting innovation for identifying and enabling new trade-chain opportunities, and (3)

providing education related to trade-chain infrastructure, innovation, and productivity.

- Georgia Tech Panama Logistics Innovation and Research Center
- Georgia Tech Costa Rica Center for Productivity
- Trade and Logistics Innovation Center of Mexico
- The Logistics Institute - Asia Pacific

Oak Ridge Associated Universities

Since 1946, students and faculty of the Georgia Institute of Technology have benefited from its membership in Oak Ridge Associated Universities (ORAU). ORAU is a consortium of ninety-one colleges and universities and a contractor for the United States Department of Energy (DOE) located in Oak Ridge, Tennessee. ORAU works with its member institutions to help their students and faculty gain access to federal research facilities throughout the country; to keep its members informed about opportunities for fellowship, scholarship, and research appointments; and to organize research alliances among its members.

Through the Oak Ridge Institute for Science and Education (ORISE), the DOE facility that ORAU operates, undergraduates, graduates, postgraduates, and faculty enjoy access to a multitude of opportunities for study and research. Students can participate in programs covering a wide variety of disciplines, including business, earth sciences, epidemiology, engineering, physics, geological sciences, pharmacology, ocean sciences, biomedical sciences, nuclear chemistry, and mathematics. Appointment and program length range from one month to four years. Many of these programs are especially designed to increase the numbers of underrepresented minority students pursuing degrees in science- and engineering-related disciplines. A comprehensive listing of these programs and other opportunities, their disciplines, and details on locations and benefits can be found in the ORISE Catalog of Education and Training Programs, which is available at www.orau.gov/orise/educ.htm, or by calling either of the contacts below.

ORAU's Office of Partnership Development seeks opportunities for partnerships and alliances among ORAU's members, private industry, and major federal facilities. Activities include faculty development programs, such as the Ralph E. Powe Junior Faculty Enhancement Awards, the Visiting Industrial Scholars Program, consortium research funding initiatives, faculty research and support programs, as well as services to chief research officers. For more information about ORAU and its programs, contact:

Charles L. Liotta
Vice Provost for Research and Dean of Graduate Studies
ORAU Councilor for Georgia Institute of Technology

Monnie E. Champion
ORAU Corporate Secretary
865.576.3306

- Oak Ridge Associated Universities

Skidaway Institute of Oceanography

Located on Skidaway Island near Savannah, Georgia, the Skidaway Institute of Oceanography (SkIO) provides a complex of coastal- and ocean-related educational and research opportunities. School of Biology faculty have laboratory facilities at the Institute. Many SkIO faculty hold adjunct appointments with Georgia Tech schools, including Civil and Environmental Engineering, Earth and Atmospheric Sciences, and Biology, and actively participate in graduate research and education. SkIO maintains small boats for local studies and the 92-foot R/V Savannah for conducting ocean research. Other unique coastal research facilities include the Bioremediation and Environmental Research Mesocosms (BERM) facility, the Saltmarsh Ecosystem Research Facility (SERF), a large recirculating flume, and the SkIO library, which is the largest in the state devoted almost exclusively to marine sciences. Areas of faculty expertise at SkIO include chemical, physical, and biological oceanography, marine ecology, and marine geology. Visitor and graduate student housing is available on site, providing convenient access to these facilities.

- Skidaway Institute of Oceanography (SkIO)
- School of Biology

VentureLab

The Georgia Tech VentureLab program helps faculty members and students to commercialize technology developed as part of the Institute's research programs. VentureLab evaluates the commercial potential of innovations and matches faculty with experienced entrepreneurs who can help form new ventures.

More details are available on the VentureLab web site.

- Blog
- Programs
- Portfolio
- People

Special Academic Programs

- Academic Common Market
- Center for Teaching and Learning (CTL)
- Dual Enrollment Program for High School Students
- Experiential Education
- Georgia Tech-Europe
- Honors Program
- Learning Communities
- Learning Support Policies
- Preprofessional Programs
- President's Scholarship Program
- ROTC
- Summer Language Programs
- The International Plan
- Transfer Programs
- Vertically Integrated Projects Program
- Research and Innovation
- Study Abroad
- Global Research and Internship Program

Academic Common Market

Undergraduate Programs

At the undergraduate level, Georgia Tech has withdrawn its programs from the Academic Common Market (ACM). This policy went into effect in the Summer 2011 semester.

Graduate Programs

At the graduate level only, Georgia Tech participates in the Academic Common Market (ACM), which is a program managed by the Southern Regional Education Board. ACM is an interstate agreement for sharing educational programs and facilities. It allows students to participate in selected programs not offered in their home states without having to pay out-of-state tuition charges..

The main purpose of the Academic Common Market is to assist states in offering together what they cannot offer alone. Residents of the participating states who qualify for admission and gain the approval of their state coordinators may enroll on an in-state tuition basis. Programs are added to and removed from the Market on an annual basis in order to reflect the changing needs of participating states. The State of Georgia currently makes program changes once annually during the spring.

These states currently participate: Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virgina.

- Southern Regional Education Board

Bachelor of Science and Master of Science Options (BS/MS Option)

The BSMS Options are formalized Graduate Course Option agreements between an undergraduate program and graduate program. These options allow a maximum of 6 hours that can be applied toward the bachelor's degree program and the master's program. These options include their own admission criteria into the master's program and their own GPA requirements. They also typically include research and mentoring components for eligible students. Students still must complete all requirements for the bachelor's and master's program. The master's degree must be completed within a two-year period following the award date of the bachelor's degree.

See below for specific BS/MS Option information regarding specific admission requirements, GPA requirements and which courses may be eligible to share between a bachelor's degree and master's degree.

See here for more information about the Graduate Course Option.

- Aerospace Engineering
- Applied Language and Intercultural Studies
- Applied Physics/Physics (BSAPHY/MSPHYS)
- Biochemistry (BSBCHEM/MSCHEM)
- Biology
- Biology and Bioinformatics (BSBIO/MSBINF)
- Biomedical Engineering
- Computer Science
- Chemical & Biomolecular Engineering
- Chemistry
- Civil Engineering
- Computational Media & Digital Media (BSCM/MSDM)
- Earth and Atmospheric Sciences
- Economics
- Economics and International Affairs (BSEIA/MSINTA)
- Electrical Engineering
- Computer Engineering
- Environmental Engineering
- Industrial Engineering and Health Systems (BSIE/MSHS)
- Industrial Engineering (BSIE/MSIE)
- Industrial Engineering and Operations Research (BSIE/MSOR)
- Industrial Engineering and Supply Chain Engineering (BSIE and MSSCE)
- International Affairs
- International Affairs and Modern Languages (BSIAML/MSINTA)
- Literature, Media, and Communication/Digital Media (BSLMC/MSDM)
- Materials Science Engineering
- Mathematics
- Mechanical Engineering
- Music Technology
- Nuclear and Radiological Engineering
- Neuroscience (BSNEUR/MSPSYC)
- Physics (BSPHYS/MSPHYS)
- Public Policy
- Psychology

Center for Teaching and Learning (CTL)

The Center for Teaching and Learning (CTL) was founded in 1986 with a mission to lead Georgia Tech to a teaching and learning standard of excellence.

CTL's undergraduate course offerings include:

- Undergraduate Teaching Assistant Preparation,
- Fundamentals of Peer Tutoring, and
- Residence Life Seminar.

CTL offers a graduate-level course in Graduate Teaching Assistant preparation and courses to prepare graduate students for faculty positions.

- Graduate Teaching Assistant Preparation,

- Fundamentals of Teaching and Learning in Higher Education,
- Course Design for Higher Education,
- Teaching Practicum in Higher Education, and
- Teaching Immersion in Higher Education.

For international graduate students and teaching assistants who want to improve their English communication skills, CTL offers courses in conjunction with the Georgia Tech Language Institute.

- Communication Skills for International TAs,
- Academic Writing for International Graduate Students,
- Oral Communication for International Graduate Students, and
- Presentation Skills for International Students.

Courses offered by the Center for Teaching and Learning (CTL) can be viewed in the Course Catalog.

Experiential Education

- Georgia Tech Career Center
- Paid and Unpaid Internships
- Graduate Internship Program

Georgia Tech Career Center

Georgia Tech believes that obtaining relevant, academically related experience outside of the classroom is an integral part of the educational process. The Career Center offers opportunities to obtain such experience through cooperative education and internships.

The Undergraduate Cooperative Plan (Co-op) has been offered at Georgia Tech since 1912. It offers students the opportunity to integrate practical experience with theory learned in the classroom. Many students participate each semester, working full time during alternating semesters, for a total of three semesters, for employers throughout the United States and the world. Accredited by the Accreditation Council for Cooperative Education, it is the largest optional co-op program in the country and one of the highest-ranked programs among public universities.

The Undergraduate Co-op Plan is available for students in all majors. Co-op students remain enrolled in school while on work terms by registering for the appropriate co-op courses.

The work experience received is a valuable asset to graduates starting out in their chosen professions. Neither college laboratory experience nor employment during vacations can take the place of organized co-op experience. The plan provides, to a substantial degree, the experience most companies require of their employees before promoting them to positions of higher responsibility. Work experience may also assist students who are undecided about their future career goals by determining early in their college careers whether they wish to continue in a particular field.

The daily contact with diverse groups among their fellow employees offers students practical insight into sociology, psychology, economics, and ethics that no textbook can supply. Finally, students receive compensation for their services from the employer. Typically, co-op students can save enough from their earnings to pay for a substantial part of their school expenses.

Internships provide practical experience for students who choose not to follow the Undergraduate Co-op Plan. Internships, the majority of which are paid positions, are an extremely viable way to obtain out-of-classroom experience. Similar to cooperative education, the jobs and the students' performance are monitored by the Career Center to ensure maximum benefit by all parties.

Students in all majors may participate in the internship program and may work any term during the academic year. There are also part-time internships available for those who wish to work while attending classes.

Program Eligibility for Co-ops and Internships:
• GPA of 2.0 or above
• Good academic standing
• Co-op students must have three or more academic semesters remaining at the start of the first work term
• Experiential Learning Application must be completed in CareerBuzz

Students are required to register their co-op terms with the Career Center and are enrolled in the CO-OP (tuition-free) 12 audit hour course. Students securing internships are also strongly encouraged to register these opportunities with the Career Center. Students will be registered in the INTN audit hours course based on the number of total work hours per week, as follows:

10-19 hours per week = 3-hour audit course
20-29 hours per week = 6-hour audit course
30-35 hours per week = 9-hour audit course
36+ hours per week = 12-hour audit course

Benefits of CO-OP and INTN Course Enrollment:

- Audit hours are recorded on the official transcript
- Earnings do not affect FAFSA status
- Maintain active student status during work terms
- Cancelation of housing without penalty if working 25 miles or more from campus
- Support from the Career Center during your work terms
- Eligibility for co-op scholarships
- Eligibility for membership in the Briaerean Honors Society
- Co-op designation on the graduation diploma at the completion of the 3 work terms with the same employer

For more information on co-ops and internships, visit our website, email us at careercenter@gatech.edu or call the Career Center at 404-894-3320.

Graduate Cooperative Plan

The Graduate Internship Program provides graduate students with the opportunity to work with industry and government leaders in their respective areas of study. Eligibility for the program is based on academic achievement at Georgia Tech. For students who are working on research, their master's and doctoral thesis-related work may be related to the internship work assignments, and can be jointly supervised by Georgia Tech faculty and company staff. Eligibility for the Graduate Internship Program is based on academic achievement at Georgia Tech. There is no tuition associated with the Graduate Internship Program, nor are there any required fees. Students are provided full-time enrollment status through registration in an audit credit Graduate Internship course. This permits students to retain all privileges of full-time enrolled students while on work assignments.

For more information, visit the Georgia Tech Graduate Internship Program site.

Paid and Unpaid Internships

In addition to the internship and cooperative programs administered through the Career Center, students may participate in internships through the academic units. These internships are either paid or unpaid.

Students who receive pay for the internship may not also receive academic credit for it. Students who receive academic credit for an internship may not also receive pay for it. There may be rare exceptions to this policy, such as the legislative internship that is part of the program in Public Policy. Exceptions have to be approved by the curriculum committee.

When students request enrollment in a departmental internship, they must (for credit or pay) complete a departmental approval form. Departmental internship sections are set up by permit only, and the student is permitted for the appropriate section to register for it.

Academic units are strongly encouraged to use the following standard numbering system for internships that they offer for pay or credit. Schools that wish to add an internship course will need to submit a new course proposal form to the curriculum committee and request course numbers under their subject codes.

Course Numbering

Freshmen and Sophomores

XXXX 2694: Undergraduate Internship for Pay (Audit only)

XXXX 2695: Undergraduate Internship for Credit

Juniors and Seniors

XXXX 4694: Undergraduate Internship for Pay (Audit only)

XXXX 4695: Undergraduate Internship for Credit

Contact Us

Dual Enrollment Program for High School Students

Georgia Tech partners with high school and home study programs to enroll students in advanced courses. Our program intends to enrich the high school experience, not replace it. Students who take classes at Georgia Tech usually continue taking classes and participating in activities and organizations in their high school communities.

Distance Math and On-Campus Dual Enrollment programs admit students for fall semester only. If you are admitted for fall semester, you may enroll in spring semester courses pending satisfactory academic performance in the fall. **Distance Computer Science admits students for Summer, Fall, or Spring semesters.** That program includes one-semester courses and students may take one or more.

The admission process is selective. Most admitted applicants have completed the highest level math and science courses available in their high school curriculum. Visit the Office of Undergraduate Admission website for more details.

Learning Support Policies

The Office of the Vice Provost for Undergraduate Education (OUE) administers the Learning Support Program. Co-requisite support courses (for non-academic credit) are offered for College Algebra, MATH 1111, and English Composition I, ENGL 1101, for students who need additional preparation to be successful in these and related courses.

Georgia Tech uses benchmark scores earned via the SAT (Evidenced-Based Reading and Writing and Math) or ACT (English and Math) to determine placement in Learning Support. Students who score below 480 on the SAT Evidence-Based Reading and Writing Section (or 17 on the ACT English) will be required to complete the learning support program for English. Students who score below 530 on the SAT Math Section (or 21 on the ACT Math) will be required to complete the learning support program for math. Students may be required to complete the learning support program for both English and math. Georgia Tech will consider the higher of the SAT and ACT scores when determining learning support placement.

Students who are required by the Institute to take courses in the Learning Support Program will be notified in writing.

Students placing into learning support for English will be required to take ENGL 0999, a three-hour (non-academic credit) course designed to reinforce critical reading and communications concepts, concurrently with ENGL 1101, a three-hour course.

Students placing into learning support for math will be required to take MATH 0999, a two-hour (non-academic credit) course designed to reinforce basic mathematical concepts, concurrently with MATH 1111, College Algebra, a four-hour course.

MATH 0999 and ENGL 0999 are not college level classes and cannot be applied to degree requirements, including free electives.

Students complete their learning support requirements when they pass the required college level course, ENGL 1101 or MATH 1111, with a grade of D or better.

Students who do not pass ENGL 1101 or MATH 1111 with a grade of D or better will be required to take both the co-requisite course and the college level course (ENGL 0999 and ENGL 1101 or MATH 0999 and MATH 1111) regardless of the grade they received in co-requisite course. Students will continue to take the combination of courses until they have passed the college level course, ENGL 1101 or MATH 1111, with grade of D or better. There is no limit to the number of times these classes and their corresponding co-requisites may be attempted.

The Learning Support Program requirements should be completed as soon as possible after matriculation to Georgia Tech. Students should work with advisors to determine the best timing for these requirements.

Contact your advisor for further information and assistance.

Preprofessional Programs

Georgia Tech offers Pre-professional programs and advising in the following areas:

- Pre-Health (includes all health professions, including pre-med, pre-dentistry, pre-pharmacy, and more)
- Pre-law
- Pre-teaching (K-12)

Students can look these advisors up on the Advising Web page.

Professional schools typically admit students with strong academic credentials, a well-balanced education, good communication skills, and a broad range of experiences. With the appropriate selection of elective courses, most majors at Georgia Tech provide suitable preparation for professional schools in any area.

The best choice of a major is usually the one in which the student has the greatest inherent interest. No specific major offers an obvious competitive advantage in assuring admission to professional schools.

Georgia Tech has elected not to have majors designated as pre-medicine, pre-dentistry, or pre-law. This approach to pre-professional education has two major advantages. First, students who elect not to enter professional school upon graduation are prepared for alternative careers immediately. Second, students who do continue on to professional school have backgrounds that often provide them with unique opportunities within their selected professions. Examples include medical research,

development of medical devices and apparatus, patent law, or the legal aspects of design and construction.

President's Scholarship Program

The Stamps President's Scholars Program is Georgia Tech's premier and most prestigious merit-based scholarship. Recipients are selected from the top applicants for admission to Georgia Tech based on demonstrated excellence in scholarship, leadership, progress, and service as described on the Stamps President's Scholars Program web page. From the applicant pool, students selected as semifinalists interview online. The top semifinalists are named finalists and invited, with their parents, to campus for additional interviews and an information weekend in March or April.

Transfer students are not eligible for the four-year award. Recipients must be US/UK/Ireland Citizens or US/UK Permanent Residents.

Each year, 40 incoming first-year students receive the Stamps President's Scholarship, which is renewable for up to four academic years or eight semesters, contingent upon honors-level performance and continued leadership development as evidenced by involvement in program, campus, and community activities. Scholarships are "full ride," including tuition and mandatory fees, room and board, books, and personal expenses. See the website below for more information on stipends.

To ensure consideration, a student must apply as an incoming first-year student, and submit the Georgia Tech Application for First-Year Admission, along with the application fee by the relevant early action deadline.

More information:

- Stamps President's Scholars Program

ROTC

Georgia Tech offers three voluntary ROTC programs: Army, Navy, and Air Force.

Depending on the student's major, Basic and Advanced ROTC classes count as a portion of elective credit. (Students may apply a maximum of 4 credit hours in Basic ROTC courses and six credit hours in Advanced ROTC courses toward meeting the elective requirements for any degree at the discretion of the school.) Consult specific colleges to determine the amount of hours that will count toward a degree. After earning a baccalaureate degree and completing the Advanced ROTC courses for any of the three services, a student may receive a commission as an officer in either the reserve or active forces.

Students accepted into the program earn more than just money for a college degree. Cadets and midshipmen receive training and experience in the one quality which is always in great demand: Leadership.

Students may apply a maximum of 4 credit hours in basic (1000-2000 level courses) ROTC courses and six hours in advanced (3000-4000 level) ROTC courses toward meeting the free elective requirements for any degree. Students should begin taking basic ROTC courses during the first term they are enrolled. For further information, see individual curricula for the schools. Please note some departments may have stricter guidelines regarding ROTC courses.

Airforce ROTC Information

Army ROTC Information

Navy ROTC Information

ROTC Credit

Air Force ROTC Website

Army ROTC Website

Navy ROTC Website

Summer Language Programs

Languages for Business and Technology (LBAT)

The School of Modern Languages offers special summer immersion programs in the countries/regions related to our areas of language study: Arabic, Chinese, French, German, Japanese, Korean, Russian, and Spanish. These intensive programs in Languages for Business and Technology (LBAT) consist of study abroad in which classroom lessons in business, culture, and technology are combined with fieldwork, cultural events, excursions, and visits to area businesses, government agencies, and social concerns, all conducted in the target language. The professional visits provide students with firsthand experience of business life, the protocols and strategies of business and technology interactions, and a heightened awareness of the current economic and social issues facing the host country. The LBAT experience offers a unique opportunity for rapid growth in proficiency, for building a deeper appreciation for the cultures and lifestyle patterns of other peoples, and for making lifelong social and professional contacts.

Depending on the particular program, students will spend 6-8 weeks abroad and earn 9-15 semester hours at the 3000 level (with some programs including offerings at the 1000 or 2000 level); these credits often can count toward a certificate, a minor, or the joint majors offered by the School of Modern Languages. Program costs vary according to the country visited and the length of the program. The HOPE scholarship applies. See the School of Modern Languages' "LBAT Programs" web page for more information.

The International Plan

In today's economy, employers are expecting to hire college graduates with international experience, global perspectives, intercultural communication skills, and the ability to work in diverse teams. In response to this need, Georgia Tech developed the International Plan, a globally-focused degree designation.

The International Plan is a challenging undergraduate academic program aimed at developing a student's global competence within the context of their major. It is an optional degree-long program that integrates overseas experiences, language proficiency, and globally-focused coursework into any participating major. It builds on existing undergraduate degree requirements and international opportunities, and it is intended to be completed within the normal time frame of a four-year undergraduate degree. Completion of the International Plan is recognized by a designation on the student's diploma, e.g., "B.S. in Electrical Engineering: International Plan."

A defining feature of the International Plan is coherence. Coherence refers to the connection between the destination(s) chosen to complete

the international experiences, the language chosen to satisfy the language requirement, and the appropriateness to the student's discipline. While some students' Plans are inherently coherent through language, other students may link the elements of their Plan through academic and/or professional topics, creating "intellectual" coherence. The program is designed to give students a deep understanding of another culture so that they develop strong intercultural skills that will help them function effectively in a global environment. Students are encouraged to think strategically about their academic and international experience choices and seek guidance from their advisors.

In order to earn the International Plan designation in a participating major, students will complete the following components:

1. Globally-Focused Coursework: Complete three courses, one from each of the following categories. Only one 1000-level course may be used to satisfy globally-focused coursework requirements.
   a. International relations
   b. A course about the country or region of the overseas experience
   c. Global economics
2. International Experience: Complete two terms abroad (at least 26 weeks) engaged in any combination of study, research, and/or internship. International experiences for the International Plan must be approved by the International Plan staff and the major IP faculty representative.
3. Second Language Proficiency: Demonstrate proficiency equivalent to four semesters of college-level language study. An optional Language Proficiency Distinction is available to students who demonstrate more advanced oral proficiency skills.
4. Culminating Course: Complete a major-specific capstone course designed to tie the international studies and experiences together with the student's discipline.
5. Have a cumulative GPA of at least 2.7 upon entrance to and graduation from the International Plan

For additional information about the International Plan visit https://oie.gatech.edu/content/international-plan.

International Relations - International Plan Electives

Course	HUM	SS	Ethics
HTS 2037		X	
HTS 2062		X	
HTS 2100		X	X
HTS 3012		X	
HTS 3055		X	
HTS 3066		X	
HTS 3067		X	
INTA 1050		x	
INTA 1110		X	
INTA 2030		X	X
INTA 2040		X	
INTA 2042		X	
INTA 2100		X	
INTA 2120		X	
INTA 2210		X	
INTA 3012		X	
INTA 3031		X	
INTA 3040		X	
INTA 3042		X	
INTA 3043		X	
INTA 3044		X	
INTA 3050		X	
INTA 3101		X	
INTA 3102		X	
INTA 3103		X	
INTA 3104		X	
INTA 3242		X	
INTA 3773		X	
INTA 4007			
INTA 4050		X	
INTA 4060		X	
INTA 4016			
INTA 4040		X	
INTA 4101		X	
INTA 4241		X	
PUBP 3600		X	X

Country or Regional - International Plan Electives

Course	HUM	SS	Ethics
ARBC 2301	X		
ARBC 3691	X		
ARBC 3692	X		
ARBC 3693	X		
ARCH 4113	X		
ARCH 4123			
ARCH 4125			
ARCH 4126		X	
ARCH 4128	X		
CHIN 3021	X		
CHIN 3022	X		
CHIN 3691	X		
CHIN 3692	X		
CHIN 3696			
CHIN 4031	X		
CHIN 4500	X		
COA 3115	X		
COA 3116	X		
FREN 3000	X		
FREN 3001	X		
FREN 3002	X		
FREN 3004	X		
FREN 3011	X		
FREN 3012	X		
FREN 3014	X		
FREN 3017	X		
FREN 3061	X		
FREN 3062	X		

FREN 3110	X			
FREN 3691	X			
FREN 3692	X			
FREN 3693	X			
FREN 3694	X			
FREN 3697				
FREN 4005				
FREN 4013	X			
FREN 4061	X			
FREN 4064				
FREN 4080				
FREN 4089				
FREN 4101	X			
FREN 4102	X			
FREN 4103	X			
FREN 4105	X			
FREN 4110				
FREN 4241	X			
FREN 4242	X			
FREN 4250			X	
FREN 4500	X			
GRMN 3030	X			
GRMN 3071	X			
GRMN 3695	X			
GRMN 3696	X			
GRMN 3697	X			
GRMN 4010	X			
GRMN 4012	X			
GRMN 4023	x			
GRMN 4024	X			
GRMN 4025	X			
GRMN 4026	X			
GRMN 4027				
GRMN 4028				
GRMN 4061	X			
GRMN 4065	X			
GRMN 4500	X			
HTS 1031		X		
HTS 2036		X		
HTS 2040		X		
HTS 2041		X		
HTS 2051		X		
HTS 2061		X		
HTS 3030		X		
HTS 3031		X		
HTS 3032		X		
HTS 3033		X		
HTS 3035		X		
HTS 3036		X		
HTS 3038		X		
HTS 3039		X		
HTS 3041		X		

HTS 3043			X	
HTS 3045			X	
HTS 3046			X	
HTS 3051			X	
HTS 3061			X	
HTS 3062			X	
HTS 3063			X	
HTS 3069			X	
ID 4203				
ID 4205				
INTA 2220			X	
INTA 2221			X	
INTA 2230			X	
INTA 2241			X	
INTA 2260			X	
INTA 3120			X	
INTA 3121			X	
INTA 3130			X	
INTA 3131			X	
INTA 3203			X	
INTA 3220			X	
INTA 3221			X	
INTA 3223			X	
INTA 3230			X	
INTA 3231			X	
INTA 3240			X	
INTA 3241			X	
INTA 3243			X	
INTA 3260				
INTA 3330			X	
INTA 3331			X	
INTA 4121			X	
INTA 4240			X	
INTA 4331			X	
INTA 4332			X	
INTA 4333			X	
INTA 4743	X			
JAPN 3401				
JAPN 3691	X			
JAPN 3692	X			
JAPN 3693	X			
JAPN 3700				
JAPN 4123	X			
JAPN 4163	X			
JAPN 4165	X			
JAPN 4173	X			
JAPN 4193				
JAPN 4500	X			
JAPN 4743	X			
JAPN 4780	X			
JAPN 6080				
KOR 4060				

KOR 3691	X
KOR 3692	X
KOR 3693	X
KOR 4500	
LMC 3102	X
LMC 3104	X
LMC 3106	X
LMC 3212	X
LMC 3302	X
LMC 3316	X
LMC 3518	X
RUSS 3222	X
RUSS 3242	
RUSS 3691	X
RUSS 3692	X
RUSS 3698	X
RUSS 4300	
RUSS 4500	
RUSS 4692	
RUSS 4693	
SPAN 3050	X
SPAN 3061	X
SPAN 3064	X
SPAN 3122	X
SPAN 3200	
SPAN 3211	X
SPAN 3235	X
SPAN 3241	X
SPAN 3242	X
SPAN 3260	X
SPAN 3300	
SPAN 3500	X
SPAN 3690	
SPAN 3592	
SPAN 3691	X
SPAN 3692	X
SPAN 3693	X
SPAN 3694	X
SPAN 4061	X
SPAN 4062	X
SPAN 4101	X
SPAN 4158	
SPAN 4160	X
SPAN 4165	X
SPAN 4170	X
SPAN 4220	X
SPAN 4255	X
SPAN 4270	
SPAN 4350	X
SPAN 4360	
SPAN 4405	
SPAN 4500	X
SPAN 4410	
SPAN 4693	

Global Economics - International Plan Electives

Course	HUM	SS	Ethics
ECON 2101		X	
ECON 4311		X	
ECON 4350		X	
ECON 4351		X	
ECON 4355		X	
ECON 4357		X	
ECON 4411		X	
ECON 4415		X	
HTS 3064		X	
INTA 2050		X	
INTA 3232		X	
INTA 3301		X	
INTA 3303		X	
INTA 3304		X	
INTA 3321		X	
INTA 4230		X	
INTA 4330		X	
INTA 4340		X	
INTA 4745			
MGT 3660			
CS 4745			

Culminating Course - International Plan Capstone

The IP Capstone is integrated into the major's senior design/seminar course. Students should enroll in the appropriate course and section for their major as listed below. Major IP faculty representatives can provide additional information and instructions

Major	Course Number
Aerospace Engineering	AE 4350/AE 4351 - IP or AE 4356/ AE 4357 - IP or AE 4358/AE 4357 - IP
Applied Languages and Intercultural Studies	CHIN 4500/FREN 4500/ GRMN 4500/JAPN 4500/ RUSS 4500/SPAN 4500
Architecture	ARCH 4012, ARCH 4011
Biochemistry	CHEM 4699 - IP, CHEM 4582, CHEM 4765, CHEM 4695, VIP (must be approved)
Biology	BIOS 4699 - IP or BIOS 4590 or BIOS 4690 or BIOS 4910
Biomedical Engineering	BMED 4600/BMED 4601 - IP
	BMED 4602 and BMED 4873
Business Administration	MGT 3659
Civil and Environmental Engineering	CEE 4090 - IP
Chemical and Biomolecular Engineering	CHBE 4520-IP or CHBE 4530-IP

Chemistry	CHEM 4699 - IP,CHEM 4582, CHEM 4765, CHEM 4695, VIP (must be approved)
Computer Science	Option 1: CS 4901 - IP plus 4XXX (crs taken abroad) - IP section
	Option 2: CS 4001 - IP or CS 4002 - IP
	Option 3: CS 4911 - IP
	Option 4: INTA 4500 (Global Citizenship section only; taught by Dr. Birchfield)
Computational Media	See IP Faculty Representative
Earth & Atmospheric Sciences	See IP Faculty Representative
Electrical and Computer Engineering	ECE 4012 - IP
Economics	See IP Faculty Representative
Economics and International Affairs	See IP Faculty Representatives
Global Economics and Modern Languages	CHIN 4500/FREN 4500/ GRMN 4500/JAPN 4500/ RUSS 4500/SPAN 4500
History, Technology, and Society	HTS 4091
International Affairs	INTA 4500 - IP
International Affairs and Modern Languages	CHIN 4500/FREN 4500/ GRMN 4500/JAPN 4500/ RUSS 4500/SPAN 4500
Industrial Design	ID 4012 - IP
Industrial and Systems	ISYE 4106 - IP
Literature, Media, and Communication	LMC 4100/LMC 4200/LMC 4300/ LMC 4400/ or LMC 4500 - IP or LMC 4102 - IP
Mechanical Engineering	ME 4182 - IP or ME 4723
Psychology	See IP Faculty Representative

Transfer Programs

Dual Degree Program

Under the Dual Degree Program, students attend the participating Dual Degree school for three years and then come to Georgia Tech for approximately two years. Students participating in the Dual Degree Program may seek a degree from any undergraduate degree-granting program in the College of Engineering. Upon completion of the program, the student receives a bachelor's degree from the first school and a bachelor's degree in one of the engineering disciplines at Georgia Tech.

Participating in the Dual Degree Program are many of the schools in the University System of Georgia, including Morehouse College, Spelman College, Clark Atlanta University, and other historically black colleges and universities (HBCU) and predominantly women's colleges in the southeast. For additional information on either of these programs, contact the College of Engineering at Georgia Tech or the Regents' Engineering Transfer Program (RETP) or Dual Degree coordinator at a participating RETP or Dual Degree institution.

Regents' Engineering Transfer Program

The Regents' Engineering Transfer Program (RETP) is a cooperative program between Georgia Tech and colleges in the University System of Georgia.

For the first two years, students in this program attend one of the participating institutions, where they take all of the mathematics and science and many of the engineering courses required in the first two years of the Georgia Tech engineering curricula. Upon successful completion of the RETP requirements at the RETP institution, students are admitted to Georgia Tech to work toward completion of a Bachelor of Science in Engineering degree.

By enrolling in RETP, students may attend a college close to home, thereby decreasing the cost of their education and easing the adjustment to college life. At the same time, RETP students enjoy many of the advantages of Tech students: they have equal access to engineering majors at Tech, they can participate in the co-op program, and they are invited to the Tech campus once a year for campus tours, information sessions, and meetings with advisors in their engineering majors.

RETP Information
RETP Transfers - Admissions

Dual Degree Program

Under the Dual Degree Program, students attend the participating Dual Degree school for three years and then come to Georgia Tech for approximately two years. Students participating in the Dual Degree Program may seek a degree from any undergraduate degree-granting program in the College of Engineering. Upon completion of the program, the student receives a bachelor's degree from the first school and a bachelor's degree in one of the engineering disciplines at Georgia Tech.

Participating in the Dual Degree Program are many of the schools in the University System of Georgia, including Morehouse College, Spelman College, Clark Atlanta University, and other historically black colleges and universities (HBCU) and predominantly women's colleges in the southeast. For additional information on either of these programs, contact the College of Engineering at Georgia Tech or the Regents' Engineering Transfer Program (RETP) or Dual Degree coordinator at a participating RETP or Dual Degree institution.

Regents' Engineering Transfer Program

The Regents' Engineering Transfer Program (RETP) is a cooperative program between Georgia Tech and colleges in the University System of Georgia.

For the first two years in this program, students attend one of the participating institutions, where they take all of the mathematics and science and many of the engineering courses required in the first two years of the Georgia Tech Engineering curricula. Upon successful completion of the RETP requirements at the partnerhing institution, students are admitted to Georgia Tech to work toward completion of a Bachelor of Science in Engineering degree.

By enrolling in RETP, students may attend a college close to home, thereby decreasing the cost of their education and easing the adjustment to college life. At the same time, RETP students enjoy many of the advantages of Georgia Tech students: they have equal access to engineering majors at Tech, they can participate in the co-op program, and they are invited to the Georgia Tech campus once a year for campus tours, information sessions, and meetings with advisors in their engineering majors.

More information:

- Regents' Engineering Transfer Program (RETP)
- Transfer Admission

Undergraduate Academics

- Bachelor's Degree Programs
- Cooperative Agreements
- Core Curriculum and Other Georgia Tech Requirements
- Credit, Tests, and Scores
- Undergraduate-Level Courses
- Undergraduate Students Taking Graduate Courses, Graduate Course Option, and BSMS Options

BS/MS Options

The BSMS Options are formalized Graduate Course Option agreements between an undergraduate program and graduate program. These options allow a maximum of 6 hours that can be applied toward the bachelor's degree program and the master's program. These options include their own admission criteria into the master's program and their own GPA requirements. They also typically include research and mentoring components for eligible students. Students still must complete all requirements for the bachelor's and master's program. The master's degree must be completed within a two-year period following the award date of the bachelor's degree.

See below for specific BS/MS Option information regarding specific admission requirements, GPA requirements and which courses may be eligible to share between a bachelor's degree and master's degree.

See here for more information about the Graduate Course Option.

- Aerospace Engineering
- Applied Language and Intercultural Studies
- Applied Physics/Physics (BSAPHY/MSPHYS)
- Biochemistry (BSBCHEM/MSCHEM)
- Biology
- Biology and Bioinformatics (BSBIO/MSBINF)
- Biomedical Engineering
- Computer Science
- Chemical & Biomolecular Engineering
- Chemistry
- Civil Engineering
- Computational Media & Digital Media (BSCM/MSDM)
- Earth and Atmospheric Sciences
- Economics
- Economics and International Affairs (BSEIA/MSINTA)
- Electrical Engineering
- Computer Engineering
- Environmental Engineering
- Industrial Engineering and Health Systems (BSIE/MSHS)
- Industrial Engineering (BSIE/MSIE)
- Industrial Engineering and Operations Research (BSIE/MSOR)
- Industrial Engineering and Supply Chain Engineering (BSIE and MSSCE)
- International Affairs
- International Affairs and Modern Languages (BSIAML/MSINTA)
- Literature, Media, and Communication/Digital Media (BSLMC/MSDM)
- Materials Science Engineering
- Mathematics
- Mechanical Engineering
- Music Technology
- Nuclear and Radiological Engineering
- Neuroscience (BSNEUR/MSPSYC)
- Physics (BSPHYS/MSPHYS)
- Public Policy
- Psychology

Cooperative Agreements

Georgia Institute of Technology and Emory University - Bachelor of Science/Juris Master's (BS-JM)

For more information on the cooperative agreement between the Georgia Institute of Technology and Emory University to offer a Bachelor of Science/Juris Master's (BS-JM), please see the link below.

http://law.emory.edu/academics/jm-degree-program/jm-dual-degrees.html

Georgia Institute of Technology and Georgia State University - Bachelor of Science/Master of Teaching program (BS-MAT)

For more information on the cooperative agreement between the Georgia Institute of Technology and Georgia State University to offer a Bachelor of Science/Master of Teaching program (BS-MAT), please see the link below.

http://mse.education.gsu.edu/programs/bachelors-and-non-degree-programs/georgiatech-b-s-m-a-t-collaboration/

Core Curriculum and other Georgia Tech Requirements

Important Note:

On March 9, 2016, the Board of Regents of the University System of Georgia approved a revision to system-wide policies related to the Core Curriculum.

1. Institutions in the University System of Georgia will not be required to identify or track overlay requirements related to US Perspectives, Global Perspectives, and Critical Thinking.
2. Students will not be required to complete the overlay requirements from this point forward.
3. Students who are scheduled to graduate in the Spring 2016 Semester and who have not completed the overlays may graduate without fulfilling this requirement.

University System of Georgia Core Curriculum Requirements

The following describe the core requirements, effective in Fall 2011 and reflecting an important change in March 2016.

The courses that can be used to satisfy the various area requirements are subject to change, and will be updated as soon as possible. Students and advisors are encouraged to check this section of the Catalog regularly to obtain the most current information.

Any courses completed that were listed in prior catalogs as satisfying the Humanities/Social Science Requirement and were completed while that edition of the Catalog was in effect may also be used to satisfy that requirement.

More information about the University System of Georgia's Core Curriculum polices is available on in the Academics & Student Affairs Handbook on the USG web site.

Core Curriculum Requirements:

- Constitution and History
- Core Area A1
- Core Area A2
- Core Area B
- Core Area C
- Core Area D
- Core Area E
- Core Area F
- Global Perspectives*
- U.S. Perspectives*

Other Georgia Tech Requirements and Attributes:

- Wellness Requirement
- Ethics Attribute

Constitution and History: US and Georgia

Georgia Code 32-171 states that "…no undergraduate student in any college or university shall receive a certificate of graduation or a degree without successfully completing course work or previously passing a satisfactory examination on the history of the United States and the history of Georgia, and upon the provisions and principles of the United States Constitution and the Constitution of Georgia."

Pursuant to the above, all undergraduate students must satisfy four legislative requirements to graduate:

1. United States History.
2. Georgia History.
3. United States Constitution.
4. Constitution of Georgia.

These implementation requirements take effect with the 2023-2024 Catalog that is effective May 1, 2023. All incoming undergraduate students who first matriculate at Georgia Tech on or after May 1, 2023 will be required to follow these implementation requirements.

Completion of the legislative requirements is required for students to be eligible to graduate with Georgia Tech undergraduate degrees.

Below are options for satisfying these legislative requirements:

United States History

Course Credit. Receive credit for either of these courses taken at Georgia Tech or receive transferred credit for either course, or receive credit for either course awarded for a score on an Advanced Placement (AP) or International Baccalaureate (IB) examination:

- HIST 2111 The United States to 1877
- HIST 2112 The United States since 1877

Examination. Earn a satisfactory score (60% or higher) on the United States History Non-Credit Canvas Course Examination. Students who elect to satisfy this legislative requirement by examination should do so before completing 90 or more credit hours. Information about this examination may be found at: https://oue.gatech.edu/glr-requirement.

Note: An examination taken to satisfy this legislative requirement does not carry any academic credit and does not satisfy any other requirement for graduation. Examination scores are used only to determine whether this legislative requirement is satisfied and are not noted or recorded on any transcript or other academic record.

Transfer Transcript. Submit a transcript for transfer from another accredited institution to Georgia Tech. If the transfer institution is within the University System of Georgia or Technical College System of Georgia, submit a transcript that includes an indication of satisfaction of this legislative requirement, as determined by the Georgia Tech Registrar's Office; Georgia Tech will honor indications of satisfaction of this legislative requirement by these institutions.

Georgia History

Course Credit. Receive credit for either of these courses taken at Georgia Tech:

- HIST 2111 The United States to 1877
- HIST 2112 The United States since 1877

Note: These Georgia Tech courses include study of Georgia History in addition to United States History; when completed at Georgia Tech, these courses satisfy both the United States History and the Georgia History legislative requirements.

Examination. Earn a satisfactory score (60% or higher) on the Georgia History Non-Credit Canvas Course Examination. Students who elect to satisfy this legislative requirement by examination should do so before completing 90 or more credit hours. Information about this examination may be found at: https://oue.gatech.edu/glr-requirement.

Note: An examination taken to satisfy this legislative requirement does not carry any academic credit and does not satisfy any other requirement for graduation. Examination scores are used only to determine whether this legislative requirement is satisfied and are not noted or recorded on any transcript or other academic record.

Transfer Transcript.

Submit a transcript for transfer from another University System of Georgia or a Technical College System of Georgia institution to Georgia Tech that includes an indication of satisfaction of this legislative

requirement, as determined by the Georgia Tech Registrar's Office; Georgia Tech will honor indications of satisfaction of this legislative requirement by these institutions.

Submit a transcript for transfer from any other accredited institution. If the transcripted course is transferable, the normal procedure for faculty review of transfer credit content will be followed to determine whether the course satisfies this legislative requirement.

United States Constitution

Course Credit. Receive credit for any of these courses taken at Georgia Tech or receive transferred credit for any of these courses:

- INTA 1200 American Government in Comparative Perspective
- POL 1101 Government of the United States
- PUBP 3000 American Constitutional Issues

Or receive credit for either of these courses awarded for a score on an Advanced Placement (AP) examination:

- INTA 1200 American Government in Comparative Perspective
- POL 1101 Government of the United States

Examination. Earn a satisfactory score (60% or higher) on the United States Constitution Non-Credit Canvas Course Examination. Students who elect to satisfy this legislative requirement by examination should do so before completing 90 or more credit hours. Information about this examination may be found at: https://oue.gatech.edu/glr-requirement.

Note: An examination taken to satisfy this legislative requirement does not carry any academic credit and does not satisfy any other requirement for graduation. Examination scores are used only to determine whether this legislative requirement is satisfied and are not noted or recorded on any transcript or other academic record.

Transfer Transcript.

Submit a transcript for transfer from another accredited institution to Georgia Tech. If the transfer institution is within the University System of Georgia or Technical College System of Georgia, submit a transcript that includes an indication of satisfaction of this legislative requirement, as determined by the Georgia Tech Registrar's Office; Georgia Tech will honor indications of satisfaction of this legislative requirement by these institutions.

Constitution of Georgia

Course Credit. Receive credit for any of these courses taken at Georgia Tech:

- INTA 1200 American Government in Comparative Perspective
- POL 1101 Government of the United States
- PUBP 3000 American Constitutional Issues

Note: These Georgia Tech courses include study of the Constitution of Georgia in addition to the United States Constitution; receiving credit for either of these courses when taken at Georgia Tech satisfies both the United States Constitution and the Constitution of Georgia legislative requirements.

Examination. Earn a satisfactory score (60% or higher) on the Constitution of Georgia Non-Credit Canvas Course Examination. Students who elect to satisfy this legislative requirement by examination should do so before completing 90 or more credit hours. Information about this examination may be found at: https://oue.gatech.edu/glr-requirement.

Note: An examination taken to satisfy this legislative requirement does not carry any academic credit and does not satisfy any other requirement for graduation. Examination scores are used only to determine whether this legislative requirement is satisfied and are not noted or recorded on any transcript or other academic record.

Transfer Transcript.

Submit a transcript for transfer from another University System of Georgia or a Technical College System of Georgia institution to Georgia Tech that includes an indication of satisfaction of this legislative requirement, as determined by the Georgia Tech Registrar's Office; Georgia Tech will honor indications of satisfaction of this legislative requirement by these institutions.

Submit a transcript for transfer from any other accredited institution. If the transcripted course is transferable, the normal procedure for faculty review of transfer credit content will be followed to determine whether the course satisfies this legislative requirement.

Social Science Attribute

Courses taken to satisfy Core Area E requirements (Social Sciences) can also be used to satisfy the legislative requirements, as specified above. The courses(s) can serve both purposes.

Note that, to satisfy Core Area E requirements, credit must be received for one of the following courses: HIST 2111, HIST 2112, POL 1101, INTA 1200, or PUBP 3000. When these courses are completed at Georgia Tech or at another University System of Georgia institution or at a Technical College System of Georgia Institution:

- HIST 2111 and HIST 2112 also satisfy both the United States History and the Georgia History legislative requirements, and
- POL 1101, INTA 1200, and PUBP 3000 also satisfy both the United States Constitution and the Constitution of Georgia legislative requirements.

Core Area A1

Core Area A1: Communication Outcomes

Area A1 is satisfied by completion of 6 credit hours as follows.

Required for all majors:

Effective Fall 2010, for freshmen entering the USG system Fall 2010, students who have earned 60 hours but have not completed Area A1 must enroll in the next course necessary to make progress toward completing this Area in every semester in which they take classes.

Effective Fall 2011, this hour limit is lowered to 45 hours for freshmen entering the USG system Fall 2011, Spring 2012, and Summer 2012.

Effective Fall 2012, the hour limit is lowered to 30 hours for freshmen entering the USG system Fall 2012 and thereafter.

Code	Title	Credit Hours
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3

Core Area A2

Core Area A2: Quantitative Outcomes

Required of all students majoring in the College of Architecture, College of Computing, College of Engineering, College of Sciences:

Area A2 is satisfied by completion of 4 semester hours as follows:

Code	Title	Credit Hours
MATH 1552	Integral Calculus	4

Required of all other majors[1]. Select one of the following:

Code	Title	Credit Hours
MATH 1712	Survey of Calculus	4
or MATH 1552	Integral Calculus	

[1] In the case of a degree (major) that is jointly offered and the Colleges' requirements in this area are different, the student must complete the course that is specified in the curriculum for the degree, regardless of which college is the declared "home" of the student. This area of the Core Curriculum is driven by the requirements of the specific degree program, not by the general requirements of the College, if a degree is jointly offered.

Effective Fall 2010, for freshmen entering the USG system Fall 2010, students who have earned 60 hours but have not completed Area A2 must enroll in the next course necessary to make progress toward completing this Area in every semester in which they take classes.

Effective Fall 2011, this hour limit is lowered to 45 hours for freshmen entering the USG system Fall 2011, Spring 2012, and Summer 2012.

Effective Fall 2012, freshmen entering the USG system Fall 2012 and thereafter, the hour limit is lowered to 30 hours.

Core Area B

Core Area B: Institutional Options

Area B is satisfied by students completing the following:

Code	Title	Credit Hours
CS 1301	Introduction to Computing [1]	3

[1] Or another CS class designated by the School

Core Area C

Core Area C: Humanities, Fine Arts, and Ethics

Core Area C is satisfied by completion of 6 semester hours in courses that carry the HUM (Humanities) attribute. Fine Arts and some ethics related courses are included under Humanities at Georgia Tech. Courses that carry both the HUM and ETHS attribute can serve both purposes.

Notice:

On March 9, 2016 the Board of Regents approved a revision to Board of Regents policies related to the Core Curriculum.

Effective immediately:

1. Institutions will not be required to identify or track overlay requirements related to US Perspectives, Global Perspectives, and Critical Thinking.
2. Students will not be required to complete the overlay requirements from this point forward.
3. Students who are scheduled to graduate this semester and who have not completed the overlays may graduate without fulfilling this requirement.

Note:

1. Any courses completed that were listed in prior catalogs as satisfying the humanities or ethics requirement and were completed while that catalog was in effect may also be used to satisfy this requirement.
2. Academic units must formally request approval for courses they deem eligible to carry the Humanities attribute from the Institute Curriculum Committee and the University System of Georgia General Education Council.
3. Humanities credit is awarded for Modern Languages 1001 classes upon successful completion of the corresponding 1002 classes. Humanities credit is awarded for SPAN 1001 only upon the successful completion of SPAN 1002. In some instances, students may complete a Modern Languages course at 1001 and then be placed at the second-semester level and complete the 2001 level course. Therefore, the sequence that will warrant HUM credit for Modern Languages courses may be either the 1001-1002 or the 1001-2001 sequence. **Note:** Any new Modern Languages course must be approved by the Institute Undergraduate Curriculum Committee and the University System of Georgia General Education Council to carry the Humanities attribute. The attribute is not automatically applied to new Modern Languages courses as new languages are introduced.
4. Undergraduate Research courses numbered 2698, 2699, 4698, and 4699 cannot be used to fulfill requirements for humanities.
5. Additional information on Music courses: Students can earn humanities credit for participation in ensembles.
6. **Humanities Credit for Ensemble Participation**
   Students can earn Humanities credit for participation in one or more specified School of Music ensembles. Each ensemble course is repeatable for credit and the following ensembles carry the humanities attribute:

Code	Title	Credit Hours
MUSI 3121	Concert Band	1
MUSI 3131	Symphonic Band	1
MUSI 3231	Chamber Choir	1
MUSI 3241	Chorale	1
MUSI 3251	Glee Club	1
MUSI 3261	Treble Choir	1
MUSI 3311	Jazz Ensemble	1
MUSI 3511	Percussion Ensemble	1
MUSI 3531	New Music Ensemble	1
MUSI 3551	Rock and Pop Ensemble	1
MUSI 3611	Symphony Orchestra	1

7. **Transfer Students:**
   Please be aware that when you see courses on your GT record that are listed with an "X" in the number (ECON 3XXX or JAPN 10X2, for example) it means that these are transfer courses and although they were not equated exactly with a GT course, they may have been accepted to meet a Core area such as Humanities and Social Science.

   If you review your records in DegreeWorks, you will be able to see how your transfer credit applies to your GT degree program. Refer to your academic advisor for more information.

Humanities Courses

Code	Title	Credit Hours
ARBC 1002	Elementary Arabic II	4
ARBC 1501	Understanding Arab Culture	3
ARBC 2001	Intermediate Arabic I	3
ARBC 2002	Intermediate Arabic II	3
ARBC 2301	Arabic Arts, Science and Technology Through History	3
ARBC 3001	Advanced Arabic I	3
ARBC 3002	Advanced Arabic II	3
ARBC 3401	Perspectives on the Arab-Israeli Conflict	3
ARBC 3501	Men-Women In Islam	3
ARBC 3691	Intensive Advanced Arabic	3
ARBC 3692	Arabic for Business and Technology I	3
ARBC 3693	Arabic for Business and Technology II	3
ARCH 2111	History of Architecture I	3
ARCH 2112	History of Architecture II	3
ARCH 2115	Modern Architecture and Art in Europe, America and Australia: Nineteenth and Twentieth Centuries	3
ARCH 3007	Art & Architecture in Greece	3
ARCH 3008	Art & Architecture in Italy I	3
ARCH 3009	Art & Architecture in Italy II	3
ARCH 4109	Architecture and Minimalism	3
ARCH 4110	Public Space: Questions and Configurations	3
ARCH 4118	American Academic Architecture	3
ARCH 4120	Atlanta Architecture	3
ARCH 4124	History of Architecture in the United States	3
ARCH 4128	Barcelona: Architecture, Urban Design, Public Space	3
ARCH 4151	History of Urban Form	3
ARCH 4305	Near and Far: Cross-Cultural Practices in Art, Architecture and Design	3
CHIN 1002	Elementary Chinese II	4
CHIN 1012	Accelerated Elementary Chinese II	4
CHIN 1501	Chinese for Heritage Learners I	3
CHIN 2001	Intermediate Chinese I	3
CHIN 2002	Intermediate Chinese II	3
CHIN 2011	Accelerated Intermediate Chinese I	3
CHIN 2012	Accelerated Intermediate Chinese II	3
CHIN 2501	Chinese For Heritage Learners II	3
CHIN 3003	Intermediate Chinese III	3
CHIN 3004	Advanced Chinese I	3
CHIN 3021	Chinese Society and Culture I	3
CHIN 3022	Chinese Society and Culture II	3
CHIN 3400	China: A Cultural Odyssey	3
CHIN 3401	A Kaleidoscope of Chinese Language	3
CHIN 3691	Chinese for Current Events	3
CHIN 3692	Business Chinese	3
CHIN 4003	Advanced Chinese II: Contemporary China	3
CHIN 4004	Advanced Chinese III: Contemporary China	3
CHIN 4021	Advanced Language, Popular Music and Culture	3
CHIN 4031	Chinese-Language Cinema: Technological, Cultural, and Urban Transformation in China	3
CHIN 4500	Advanced Intercultural Seminar	3
COA 2241	History of Art I	3
COA 2242	History of Art II	3
COA 3114	Art and Architecture in Classical Greece	3
COA 3115	Art and Architecture in Italy I	3
COA 3116	Art and Architecture in Italy II	3
CP 4040	The City in Fiction and Film	3
CS 4752	Philosophical Issues in Computation	3
FREN 1002	Elementary French II	3
FREN 2001	Patterns of French Culture I	3
FREN 2002	Patterns of French Culture II	3
FREN 2005	LBAT French Culture and Language	6
FREN 3000	Survey of French Literature	3
FREN 3001	French Literature from 1800 to 1900	3
FREN 3002	French Literature from 1900 to Present	3
FREN 3004	Drama Workshop	3
FREN 3011	France Today I	3
FREN 3012	France Today II	3
FREN 3014	Introduction to Contemporary France	3
FREN 3015	Social Identities in Contemporary French Culture	3
FREN 3017	Paris: Modernity Today	3
FREN 3030	French Phonetics	3
FREN 3040	Reading and Translation	3
FREN 3061	France: Culture, Economy, Commerce I	3
FREN 3062	France: Culture, Economy and Commerce II	3

FREN 3110	Comics & Graphic Arts	3
FREN 3120	French Conversation and Culture	3
FREN 3121	Advanced Composition	3
FREN 3500	Field Work Abroad	1-3
FREN 3551	French for the Professions I	3
FREN 3691	Business Communication and Correspondence in France	3
FREN 3692	French for Business and Technology I	3
FREN 3693	French for Business and Technology II	3
FREN 3694	French for Business and Technology Abroad	3
FREN 4001	French Stylistics	3
FREN 4011	French Art	3
FREN 4013	French Literature and the Visual Arts	3
FREN 4061	French Science and Technology I	3
FREN 4101	Literature of the Francophone World I	3
FREN 4102	Literature of the Francophone World II	3
FREN 4103	Francophone Africa	3
FREN 4105	Francophone Cinema	3
FREN 4107	The African Diasporas in France	3
FREN 4200	Introduction to French Philosophy	3
FREN 4241	Migration in French Cinema	3
FREN 4242	The French New Wave	3
FREN 4300	France and Globalization	3
FREN 4500	Advanced Intercultural Seminar	3
GRMN 1002	Elementary German II	3
GRMN 2001	Intermediate German I	3
GRMN 2002	Intermediate German II	3
GRMN 3010	Introduction to German Literature	3
GRMN 3011	Germany Today	3
GRMN 3024	Conversation and Composition	3
GRMN 3026	German Stylistics	3
GRMN 3030	Crossing Borders in Literature & Culture	3
GRMN 3055	German Fairy Tales: From the Grimm Brothers to Disney	3
GRMN 3071	Introductory Business German I	3
GRMN 3110	Television & Electronic Culture	3
GRMN 3695	German Business and Technology: Structure, Communication and Correspondence	3
GRMN 3696	German Business and Technology: Current Issues	3
GRMN 3697	German Business and Technology: Communication	3
GRMN 4010	Perspectives of German Media	3
GRMN 4012	Typical German Towards a German Identity	3
GRMN 4023	Selected Readings in German Literature	3
GRMN 4024	German Film and Literature	3
GRMN 4025	German Culture & Film	3
GRMN 4026	German Post-Wall Cinema	3
GRMN 4061	Advanced Business German I	3
GRMN 4065	The European Union: History, Institutions and Current Issues and Challenges	3
GRMN 4120	Literary Representations of German History	3
GRMN 4126	Advanced Stylistics: Grammar and Discourse	3
GRMN 4500	Advanced Intercultural Seminar	3
GRMN 4693	Industrial Transformation and German Society/ Economy	3
ID 2202	History of Modern Industrial Design	3
ID 2241	History of Art 1	3
ID 2242	History of Art 2	3
ID 4206	Culture of Objects: A Seminar on the Design and Culture of Objects	3
INTA 4743	Japanese Society and Politics	3
JAPN 1002	Elementary Japanese II	4
JAPN 2001	Intermediate Japanese I	3
JAPN 2002	Intermediate Japanese II	3
JAPN 3001	Advanced Japanese I	3
JAPN 3691	Technical and Scientific Japanese	3
JAPN 3692	Business Japanese	3
JAPN 3693	Japan Today	3
JAPN 4113	Advanced reading and Listening in Japanese	3
JAPN 4123	Technical and Business Japanese Translation	3
JAPN 4163	Introduction to Japanese Literature and Culture	3
JAPN 4165	Critical Readings in Japanese Culture and Arts	3
JAPN 4173	Japanese Culture and Society through Anime	3
JAPN 4231	Designing Websites in Japanese	3
JAPN 4233	CALI Pedagogy for Japanese	3
JAPN 4235	3D RPG Development for Japanese Instruction	3
JAPN 4500	Advanced Intercultural Seminar	3
JAPN 4543	Advanced Japanese for NLP Development	3
JAPN 4743	Japanese Society and Politics	3
JAPN 4750	Japanese Discourse and Grammar	3
JAPN 4780	Japanese Applied Linguistics	3
KOR 1002	Elementary Korean II	4
KOR 2001	Intermediate Korean I	3
KOR 2002	Intermediate Korean II	3
KOR 3001	Advanced Korean I	3
KOR 3002	Advanced Korean II	3
KOR 3410	Korean Culture: Old and New	3
KOR 3415	Korea in Media: K-Pop, Film, and Drama	3
KOR 3691	Business Korean	3
KOR 3692	Current Issues and Technology in Korea	3
KOR 3693	Exploring Modern Korea	3
KOR 4001	Contemporary Korean	3
KOR 4002	Selected Readings Of Modern Korean	3
LING 2100	Introduction to Linguistics	3
LING 3100	Applications of Linguistics	3
LING 4780	Japanese Applied Linguistics	3
LMC 2000	Introduction to Literature, Media, and Communication	3
LMC 2050	Seminar in Literature, Media, and Communication	3
LMC 2060	Introduction to Literary Studies	3
LMC 2100	Introduction to Science, Technology and Culture	3
LMC 2200	Introduction to Gender Studies	3

LMC 2400	Introduction to Media Studies	3
LMC 2500	Introduction to Film	3
LMC 2600	Introduction to Performance Studies	3
LMC 3102	Science, Technology, and the Classical Tradition	3
LMC 3104	The Age of Scientific Discovery	3
LMC 3106	The Age of Scientific Revolution	3
LMC 3112	Evolution and the Industrial Age	3
LMC 3202	Studies in Fiction	3
LMC 3204	Poetry and Poetics	3
LMC 3206	Communication and Culture	3
LMC 3208	African American Literature and Culture	3
LMC 3210	Ethnicity in American Culture	3
LMC 3212	Women, Literature, and Culture	3
LMC 3214	Science Fiction	3
LMC 3215	Science Fiction Film and Television	3
LMC 3219	Literature and Medicine	3
LMC 3225	Gender Studies in the Disciplines	3
LMC 3226	Major Authors	3
LMC 3228	Shakespeare	3
LMC 3234	Creative Writing	3
LMC 3236	Writing for the Stage and Screen	3
LMC 3252	Studies in Film and Television	3
LMC 3253	Animation	3
LMC 3254	Film History	3
LMC 3255	Cinema and Digital Culture	3
LMC 3256	Major Filmmakers	3
LMC 3257	Global Cinema	3
LMC 3258	Documentary Film	3
LMC 3259	Experimental Film	3
LMC 3262	Performance Studies	3
LMC 3263	Music, Culture, and Society	3
LMC 3302	Science, Technology, and Ideology	3
LMC 3304	Science, Technology, and Gender	3
LMC 3306	Science, Technology, and Race	3
LMC 3308	Environmentalism and Ecocriticism	3
LMC 3310	The Rhetoric of Scientific Inquiry	3
LMC 3314	Technologies of Representation	3
LMC 3316	Science, Technology, and Postcolonialism	3
LMC 3318	Biomedicine and Culture	3
LMC 3352	Film and/as Technology	3
LMC 3405	Media, Culture, and Society	3
LMC 3502	Ancient and Medieval Literature and Culture	3
LMC 3504	Renaissance Literature and Culture	3
LMC 3506	Enlightenment and Culture	3
LMC 3511	American Literature & Culture	3
LMC 3512	British and Continental Romanticism	3
LMC 3514	Victorian Literature and Culture	3
LMC 3516	Literary and Cultural Modernism	3
LMC 3518	Literary and Cultural Postmodernism	3
LMC 3520	Contemporary Issues in Literature & Culture	3
LMC 4204	Poetry and Poetics II	3
ML 2500	Think Globally, Act Locally: An Introduction to Cross-Cultural Studies	3
MUSI 2010	Fundamentals of Musicianship I	3
MUSI 2011	Fundamentals of Musicianship II	3
MUSI 2700	Introduction to Music Theory	3
MUSI 3121	Concert Band	1
MUSI 3131	Symphonic Band	1
MUSI 3231	Chamber Choir	1
MUSI 3241	Chorale	1
MUSI 3251	Glee Club	1
MUSI 3261	Treble Choir	1
MUSI 3311	Jazz Ensemble	1
MUSI 3450	Survey of Music Technology	3
MUSI 3511	Percussion Ensemble	1
MUSI 3531	New Music Ensemble	1
MUSI 3551	Rock and Pop Ensemble	1
MUSI 3611	Symphony Orchestra	1
MUSI 3621	Musicians & their Music	3
MUSI 3630	The History of Jazz, the Roots and Evolution of an American Musical Art Form	3
MUSI 4450	Integrating Music Into Multimedia	3
MUSI 4455	Streaming Media	3
PERS 1002	Elementary Persian II	4
PERS 2001	Intermediate Persian I	3
PERS 2002	Intermediate Persian II	3
PHIL 2010	Introduction to Philosophical Analysis	3
PHIL 2025	Philosophical Analysis of Policy Choices	3
PHIL 3050	Political Philosophy	3
PHIL 3102	Ancient Philosophy	3
PHIL 3103	Modern Philosophy	3
PHIL 3105	Ethical Theories	3
PHIL 3109	Engineering Ethics	3
PHIL 3113	Logic and Critical Thinking	3
PHIL 3115	Philosophy of Science	3
PHIL 3127	Science, Technology, and Human Values	3
PHIL 3135	Philosophy of Technology	3
PHIL 3140	Philosophy of Food	3
PHIL 4110	Theories of Knowledge	3
PHIL 4174	Perspectives in Science and Technology	3
PHIL 4176	Environmental Ethics	3
PHIL 4752	Philosophical Issues in Computation	3
RUSS 1002	Elementary Russian II	4
RUSS 1250	Vampires and Memory of Stalinism in Post-Soviet Russia	3
RUSS 1692	Intensive Elementary Russian II	3
RUSS 2001	Intermediate Russian I	3
RUSS 2002	Intermediate Russian II	3
RUSS 2691	Intensive Intermediate Russian I	3
RUSS 2692	Intensive Intermediate Russian II	3
RUSS 3001	Advanced Russian I	3
RUSS 3002	Advanced Russian II	3
RUSS 3222	The Russian Twentieth Century in Literature and Film	3

RUSS 3691	Intensive Advanced Russian	3
RUSS 3692	Advanced Reading and Composition for Business, Science and Technology	3
RUSS 3698	Russia Yesterday and Today	1
SPAN 1002	Elementary Spanish II	3
SPAN 2001	Intermediate Spanish I	3
SPAN 2002	Intermediate Spanish II	3
SPAN 2690	Intermed Span Abroad	3
SPAN 3050	Introduction to Reading Hispanic Literature	3
SPAN 3061	Spanish for Business I: Fundamentals	3
SPAN 3064	Medical Spanish	3
SPAN 3101	Spanish Conversation: Issues and Strategies I	3
SPAN 3111	Composition: Analysis and Development I	3
SPAN 3122	Cultural History of Spain II: Nineteenth and Twentieth Century Spain	3
SPAN 3211	Spain Today	3
SPAN 3235	Latin America Today	3
SPAN 3241	The Individual and the Family in Hispanic Literature	3
SPAN 3242	Society in Hispanic Literature	3
SPAN 3260	Identity in Hispanic American Literature	3
SPAN 3500	Science Fiction in Latin America	3
SPAN 3691	Business Communication and Correspondence in the Hispanic	3
SPAN 3692	Business and Culture in the Hispanic World	3
SPAN 3693	Science and Technology in the Hispanic World	3
SPAN 3694	Business and Culture in the Hispanic World: Seminar Abroad	3
SPAN 3697	Spanish for Health Care Professionals	3
SPAN 3698	Health Care Industry in Spain	3
SPAN 4061	Spanish for Science and Technology I: Fundamentals	3
SPAN 4062	Spanish for Science and Technology II: Applications	3
SPAN 4065	Spanish Linguistics	3
SPAN 4101	Advanced Communication Workshop	3
SPAN 4150	Learning in the Hispanic Community	3
SPAN 4160	U.S. Spanish: Language and Cultures	3
SPAN 4165	Bilingualism in the Spanish Speaking World	3
SPAN 4170	Spanish Applied Linguistics	3
SPAN 4220	Nation and Narration in Latin America	3
SPAN 4251	Hispanic Community Internship	3
SPAN 4255	Hispanic Drama Workshop	3
SPAN 4350	Ibero-American Cities	3
SPAN 4500	Advanced Intercultural Seminar	3

Courses that fulfill both Humanities and Ethics Requirements

Code	Title	Credit Hours
LMC 3219	Literature and Medicine	3
LMC 3304	Science, Technology, and Gender	3
LMC 3318	Biomedicine and Culture	3
PHIL 3105	Ethical Theories	3
PHIL 3109	Engineering Ethics	3
PHIL 3127	Science, Technology, and Human Values	3
PHIL 3140	Philosophy of Food	3
PHIL 4176	Environmental Ethics	3

Core Area D

Core Area D: Natural Sciences, Math, and Technology

Core Area D is satisfied by students completing 8 semester hours from the science list and 4 semester hours from the Mathematics list.

Science

8 semester hours

Notice: The School of Biological Sciences has updated the course pre-fix for BIOL and APPH courses (excluding APPH 1040 and APPH 1050) effective in the 2019-20 Catalog year. Students who have taken BIOL 1220, BIOL 1510, BIOL 1520 may still use those courses toward Core D requirements.

Code	Title	Credit Hours
CHEM 1211K	Chemical Principles I	4
CHEM 1212K	Chemical Principles II	4
CHEM 1310	Principles of General Chemistry for Engineers	4
BIOS 1220	Biology of Sex & Death	4
BIOS 1107 & 1107L	Biological Principles and Biological Principles Laboratory [1]	4
BIOS 1108 & 1108L	Organismal Biology and Organismal Biology Laboratory [2]	4
EAS 1600	Introduction to Environmental Science	4
EAS 1601	Habitable Planet	4
EAS 2600	Earth Processes	4
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4

[1] Biology majors should take BIOS 1207 and BIOS 1207L.
[2] Biology majors should take BIOS 1208 and BIOS 1208L.

Mathematics

4-6 semester hours

All students with majors in the Colleges of Architecture, Engineering, and Science

Code	Title	Credit Hours
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2

All students with majors in the College of Computing

Code	Title	Credit Hours
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra	4

All other majors [1]

Select one of the following:

Code	Title	Credit Hours
MATH 1711	Finite Mathematics	4
or MATH 1551	Differential Calculus	5
& MATH 1552	and Introduction to Linear Algebra	3

Honors versions of the above courses are also accepted.

[1] In the case of a degree (major) that is jointly offered and the Colleges' requirements in this area are different, the student must complete the course that is specified in the curriculum for the degree, regardless of which college is the declared "home" of the student. This area of the Core Curriculum is driven by the requirements of the specific degree program, not by the general requirements of the College, if a degree is jointly offered.

Core Area E

Core Area E: Social Sciences

Area E is satisfied by completion of 12 credit hours as follows:

Code	Title	Credit Hours
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
POL 1101	Government of the United States	
INTA 1200	American Government in Comparative Perspective	
PUBP 3000	American Constitutional Issues	
Select 9 credit hours from the following list.		9
Total Credit Hours		**12**

Some social science courses also carry the ethics attribute. Those courses may be used to satisfy both the SOC SCI and the Ethics requirements. **Credit not awarded for both** POL 1101 **and** INTA 1200.

Any courses completed that were listed in prior catalogs as satisfying the humanities/social science requirement and were completed while that catalog was in effect may also be used to satisfy this requirement.

Academic units must formally request approval for courses they deem eligible to carry the Social Science attribute from the Institute Curriculum Committee and the University System of Georgia General Education Council.

Students can receive three credit hours for any one of:

Code	Title	Credit Hours
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Total Credit Hours		**3**

The only combination for which students can receive six credit hours is ECON 2105 together with ECON 2106.

Undergraduate Research courses numbered 2698, 2699, 4698, and 4699 cannot be used to fulfill requirements for Social Sciences.

Transfer Students: Please be aware that when you see courses on your GT record that are listed with an "X" in the number (ECON 3XXX or JAPN 10X2, for example) it means that these are transfer courses and although there were not equated exactly with a GT course, they may have been accepted to meet a Core area such as Humanities and Social Science.

If you review your records in DegreeWorks, you will be able to see how your transfer credit applies to your GT degree program. Refer to your academic advisor for more information.

Social Sciences Courses

Code	Title	Credit Hours
ARCH 3135	City Literacy	3
ARCH 4107	Introduction to Historic Preservation	3
ARCH 4137	Postwar Architecture and Urbanism in the U.S.: Design, Politics & History	3
ARCH 4335	The Social Practice of Architecture	3
ARCH 4770	Psychology and Environmental Design	3
CP 4010	Foundations of Urban and Regional Development	3
CP 4020	Introduction to Urban and Regional Planning	3
CP 4030	The City and Its Technology	3
ECON 2100	Economic Analysis and Policy Problems	3
ECON 2101	The Global Economy	3
ECON 2105	Principles of Macroeconomics	3
ECON 2106	Principles of Microeconomics	3
ECON 3300	Economics of International Energy Markets	3
ECON 4160	Economic Forecasting	3
ECON 4180	Game Theory I	3
ECON 4232	Labor Economics	3
ECON 4311	Strategic Economics for Global Enterprise	3
ECON 4340	Economics of Industrial Competition	3
ECON 4350	International Economics	3
ECON 4351	International Financial Economics	3
ECON 4355	Global Financial Economics	3
ECON 4357	Law and Economics of the Global Trading System	3
ECON 4411	Economic Development	3
ECON 4415	Conflict and Security in Developing Countries	3
ECON 4421	Urban and Regional Economics	3
ECON 4430	Economics of Transportation and Communication Systems	3
ECON 4440	Economics of Natural Resources and the Environment	3
ECON 4450	Topics in African American Entrepreneurship	3
ECON 4460	Public Economics	3

ECON 4510	Economics of Health and Health Care	3
ECON 4610	Seminar in Economic Policy	3
ECON 4620	History of Economic Thought	3
HIST 2111	The United States to 1877	3
HIST 2112	The United States since 1877	3
HTS 1001	Introduction to History, Technology, and Society	3
HTS 1031	Europe Since the Renaissance	3
HTS 1081	Engineering in History	3
HTS 2001	Early American History	3
HTS 2002	The American Revolution and Constitution	3
HTS 2006	History of the Old South to 1865	3
HTS 2007	History of the New South since 1865	3
HTS 2011	The Gilded Age and the Progressive Era	3
HTS 2013	Modern America: World War II and After	3
HTS 2015	History of Sports in America	3
HTS 2016	Social Issues and Public Policy	3
HTS 2017	Environmental Sociology	3
HTS 2018	Food and Society	3
HTS 2036	Revolutionary Europe: 1789-1914	3
HTS 2037	Twentieth Century Europe: 1914 to Present	3
HTS 2040	History of Islamic Societies	3
HTS 2041	History of the Modern Middle East	3
HTS 2051	Colonial Latin America and the World	3
HTS 2052	North American Borderlands	3
HTS 2053	Modern Latin American History	3
HTS 2061	Traditional Asia and Its Legacy	3
HTS 2062	Asia in the Modern World	3
HTS 2080	Introduction to the History of Disease and Medicine	3
HTS 2081	The Scientific Revolution	3
HTS 2082	Technology and Science in the Industrial Age	3
HTS 2084	Technology and Society	3
HTS 2085	Reel History I: US History through Hollywood Films	3
HTS 2100	Sci, Tech & Modern World	3
HTS 2101	Historical and Social Research	3
HTS 3001	American Economic History	3
HTS 3002	History of American Business	3
HTS 3003	Sociology of Economic Institutions	3
HTS 3005	American Environmental History	3
HTS 3006	United States Labor History	3
HTS 3007	Sociology of Work, Industry, and Occupations	3
HTS 3008	Class, Power, and Social Inequality	3
HTS 3009	The American Civil War	3
HTS 3011	The City in American History	3
HTS 3012	Urban Sociology	3
HTS 3015	History of the Vietnam War	3
HTS 3016	Women and Gender in the United States	3
HTS 3017	Sociology of Gender	3
HTS 3018	New Religions and Cults in America	3
HTS 3019	The Family, Sexuality, and Social Change in America	3
HTS 3020	Gender and Technology	3
HTS 3021	Women in Science and Engineering	3
HTS 3022	Gender and Sports	3
HTS 3023	Slaves without Masters: Free People of Color before 1865	3
HTS 3024	African American History to 1865	3
HTS 3025	African American History since 1865	3
HTS 3026	Sociology of Race and Ethnicity	3
HTS 3027	The Civil Rights Movement	3
HTS 3028	Ancient Greece: Gods, Heroes, and RuinS	3
HTS 3029	Ancient Rome: From Greatness to Ruins	3
HTS 3030	Medieval Europe: 350 to 1400	3
HTS 3031	European Labor History	3
HTS 3032	Modern European Intellectual History	3
HTS 3033	Medieval England	3
HTS 3035	Britain from 1815-1914	3
HTS 3036	Britain Since 1914	3
HTS 3038	The French Revolution	3
HTS 3039	Modern France	3
HTS 3041	Modern Spain	3
HTS 3043	Modern Germany	3
HTS 3045	Nazi Germany and the Holocaust	3
HTS 3046	Science, Polilitics, and Culture in Nazi Germany	3
HTS 3048	Modern Russian History and Society	3
HTS 3051	Women and the Politics of Gender in the Middle East	3
HTS 3055	Globalization in the Modern Era	3
HTS 3061	Modern China	3
HTS 3062	Modern Japan	3
HTS 3063	Outposts of Empire: Comparative History of British	3
HTS 3064	Sociology of Development	3
HTS 3065	History of Global Societies	3
HTS 3066	Sociology of Politics and Society	3
HTS 3067	Revolutionary Movements in the Modern World	3
HTS 3068	Social Movements	3
HTS 3069	Modern Cuba	3
HTS 3070	Culture and Society	3
HTS 3071	Sociology of Crime	3
HTS 3072	Sociology of Education	3
HTS 3073	Sociology of Sports	3
HTS 3082	Sociology of Science	3
HTS 3083	Technology and the Shaping of American Society	3
HTS 3084	Culture and Technology	3
HTS 3085	Law, Technology, and Politics	3
HTS 3086	Sociology of Medicine and Health	3
HTS 3087	History of Medicine	3
HTS 3088	Race, Medicine & Science	3
HTS 3089	Sceince, Technology and Sports	3
HTS 3100	Introduction to Museum Studies	3
HTS 3102	Social Theory and Social Structure	3
HTS 4001	Seminar in United States History	4

HTS 4011	Seminar in Sociology	4
HTS 4031	Seminar in European History	4
HTS 4061	Seminar in Asian History	4
HTS 4081	Seminar in History of Technology	4
INTA 1050	The World Today	3
INTA 1110	Introduction to International Relations	3
INTA 1200	American Government in Comparative Perspective	3
INTA 2030	Ethics in International Affairs	3
INTA 2040	Science, Technology, and International Affairs	3
INTA 2042	Introduction to Global WMD Issues	3
INTA 2050	Introduction to Global Development	3
INTA 2100	Theoretical Approaches to Great Power Relations	3
INTA 2120	Introduction to International Security	3
INTA 2210	Comparative Political Philosophies and Ideologies	3
INTA 2220	Government and Politics of Western Europe	3
INTA 2221	Politics of the European Union	3
INTA 2230	Government and Politics of Asia	3
INTA 2241	Government, Politics and Society of Latin America	3
INTA 2260	Government, Politics and Society of the Middle East	3
INTA 3010	International Technology Transfer	3
INTA 3012	War in the 20th Century	3
INTA 3020	Contemporary Mexico	3
INTA 3031	Human Rights in a Technological World	3
INTA 3040	Energy, Environment, and Policy	3
INTA 3042	Energy and International Security	3
INTA 3043	Space Policy	3
INTA 3044	Global Politics of Technology	3
INTA 3050	The Meaning of Global Citizenship	3
INTA 3101	International Institutions	3
INTA 3102	The Problem of Proliferation	3
INTA 3103	The Challenge of Terrorism	3
INTA 3104	International Negotiations	3
INTA 3110	U.S. Foreign Policy	3
INTA 3111	U.S. Defense Policy	3
INTA 3120	European Security Issues	3
INTA 3121	Foreign Policies of Russia and Eurasia	3
INTA 3130	Foreign Policy of China	3
INTA 3131	Pacific Security Issues	3
INTA 3203	Comparative Politics	3
INTA 3220	Government and Politics of Germany	3
INTA 3221	Post-Soviet Government and Politics	3
INTA 3223	Transatlantic Relations	3
INTA 3230	Government and Politics of China	3
INTA 3231	Government and Politics of Japan	3
INTA 3232	Sustainable Megaregion	3
INTA 3240	Government and Politics of Africa	3
INTA 3241	Latin American Politics	3
INTA 3242	Soccer and Global Politics	3
INTA 3243	US - Latin American Relations	3
INTA 3260	Middle East Relations	3
INTA 3301	International Political Economy	3
INTA 3303	Political Economy of Development	3
INTA 3304	International Trade and Production	3
INTA 3321	Political Economy of European Integration	3
INTA 3330	Political Economy of China	3
INTA 3331	Political Economy of Japan	3
INTA 4011	Technology and Military Organization	3
INTA 4040	Environmental Politics	3
INTA 4050	International Affairs and Technology Policy Making	3
INTA 4060	International Law	3
INTA 4101	Politics of the Vietnam War	3
INTA 4121	Seminar in Europe: European Security	3
INTA 4230	Seminar in Europe: European Union	3
INTA 4240	Argentine Politics, History, and Culture	3
INTA 4241	Democracy in the Global South	3
INTA 4330	Chinese Economic Reform	3
INTA 4331	Chinese Politics in Transition	3
INTA 4332	Chinese Institutions and Policy Process	3
INTA 4333	Korean Security Policy	3
INTA 4340	Latin American Regional Economic and Political Integration	3
INTA 4500	Pro-Seminar in International Affairs	3
POL 1101	Government of the United States	3
POL 2101	State and Local Government	3
PSYC 1101	General Psychology	3
PSYC 2015	Research Methods	4
PSYC 2103	Human Development Over the Life Span	3
PSYC 2210	Social Psychology	3
PSYC 2220	Industrial/Organizational Psychology	3
PSYC 2230	Abnormal Psychology	3
PSYC 2240	Personality Theory	3
PSYC 2250	Cross-Cultural Psychology	3
PSYC 2270	Introduction to Engineering Psychology	3
PSYC 2280	Psychology of Creativity and Art	3
PSYC 2760	Human Language Processing	3
PSYC 3012	Introduction to Cognitive Psychology	3
PSYC 3040	Sensation and Perception	3
PSYC 3041	Human Sensation and Perception	4
PSYC 4260	Psychology of Aging	3
PSYC 4770	Psychology and Environmental Design	3
PUBP 2010	Political Processes	3
PUBP 2012	Foundations of Public Policy	3
PUBP 2030	Organizations and Policy	3
PUBP 3000	American Constitutional Issues	3
PUBP 3016	Judicial Process	3
PUBP 3020	Applied Political Economy	3
PUBP 3030	Policy Analysis	3
PUBP 3042	Data Science for Public Policy	3
PUBP 3120	Statistical Analysis for Public Policy	3

PUBP 3130	Research Methods and Problem Solving	3
PUBP 3201	Introduction to Social Policy	3
PUBP 3214	African American Politics	3
PUBP 3230	STEM Education Policy	3
PUBP 3315	Environmental Policy and Politics	3
PUBP 3320	Climate Policy	3
PUBP 3350	Energy Policy	3
PUBP 3510	Politics and Policy	3
PUBP 3600	Sustainability, Technology, and Policy	3
PUBP 3610	Pre-Law Seminar	3
PUBP 4010	Policy Task Force I	3
PUBP 4020	Policy Task Force II	3
PUBP 4111	Internet and Public Policy	3
PUBP 4120	Survey Research Methods	3
PUBP 4130	Policy Analysis and Program Evaluation	3
PUBP 4140	Foundations of Leadership	3
PUBP 4200	Social Policy Issues	3
PUBP 4211	Urban Policy	3
PUBP 4212	Women and Public Policy	3
PUBP 4214	Gender, Science, Technology, and Public Policy	3
PUBP 4226	Business and Government	3
PUBP 4260	Economic Development Policy and Planning	3
PUBP 4338	Environmental Impact Assessment	3
PUBP 4410	Science, Technology, and Public Policy	3
PUBP 4414	Technology, Innovation, and Policy	3
PUBP 4416	Critical Issues in Science and Technology	3
PUBP 4440	Science, Technology, and Regulation	3
PUBP 4501	Info Policy & Management	3
PUBP 4514	Mass Communication Policy	3
PUBP 4600	Senior Seminar/Thesis	3
PUBP 4609	Legal Practice	3
PUBP 4640	Technology Law, Policy, and Management	3
PUBP 4650	Internet Law	3
SOC 1101	Introduction to Sociology	3

Social Sciences Courses that Also Satisfy Ethics Requirement

Code	Title	Credit Hours
HTS 1081	Engineering in History	3
HTS 2061	Traditional Asia and Its Legacy	3
HTS 2084	Technology and Society	3
HTS 2100	Sci, Tech & Modern World	3
HTS 3032	Modern European Intellectual History	3
INTA 2030	Ethics in International Affairs	3
PSYC 1101	General Psychology	3
PSYC 2015	Research Methods	4
PSYC 2210	Social Psychology	3
PSYC 2220	Industrial/Organizational Psychology	3
PSYC 2230	Abnormal Psychology	3
PSYC 2240	Personality Theory	3
PSYC 2270	Introduction to Engineering Psychology	3
PUBP 3600	Sustainability, Technology, and Policy	3

Core Area F

Core Area F - Lower-Division Major Requirements

Core Area F requirements vary with degree and major. It is expected that there will be 18 credit hours of lower division requirements in each major.

Ethics

The courses listed below carry the Georgia Tech-specific Ethics attribute. While some courses (as designated) meet Humanities or Social Science requirements, not all of the courses listed below will meet Core Curriculum (general education) requirements. Additionally, some programs may require specific courses that address their ethics degree requirements. These specific courses may or may not appear on the list below. Check with the major school accordingly.

Any course that is to be assigned the Ethics attribute must receive approval from the Institute Undergraduate Curriculum Committee GenEd and Policy Subcommittee, the Institute Undergraduate Curriculum Committee, and the Academic Senate. Courses that are considered for approval to carry the Ethics attribute must address the Ethics Attribute Learning Outcomes in the course syllabus.

The learning outcomes for the ethics attribute are broadly crafted to accommodate ethical principles and applications across disciplines.

Course proposals should include learning outcomes that reflect these broad institution-level statements but are contextualized to reflect disciplinary principles and course level content.

To carry the Georgia Tech-specific ethics attribute, a course must demonstrate alignment of course level objectives, content, and assessments with each of the following:

1. An ability to recognize ethical and professional responsibilities in real-world contexts.
2. An ability to assess actions or decisions based on established ethical principles and theories, or through deliberative processes.
3. An ability to consider the implications of actions, both broadly (e.g. global, economic, environmental, or societal) and for individuals.

Code	Title	Credit Hours
BIOS 4651	Bioethics	3
CHBE 4515	Chemical Process Safety	1
CS 4001	Computing, Society, and Professionalism	3
CS 4726	Privacy, Technology, Policy, and Law	3
HTS 1081	Engineering in History	3
HTS 2061	Traditional Asia and Its Legacy	3
HTS 2084	Technology and Society	3
HTS 2100	Sci, Tech & Modern World	3
HTS 3032	Modern European Intellectual History	3
INTA 2030	Ethics in International Affairs	3
LMC 3219	Literature and Medicine	3
LMC 3304	Science, Technology, and Gender	3

LMC 3318	Biomedicine and Culture	3
MGT 3608	Technology Law and Ethics	3
MGT 4047	Ethics & Accounting	3
MGT 4726	Privacy, Technology, Policy, and Law	3
NS 4322	Naval Leadership and Ethics	3
PHIL 3105	Ethical Theories	3
PHIL 3109	Engineering Ethics	3
PHIL 3127	Science, Technology, and Human Values	3
PHIL 3140	Philosophy of Food	3
PHIL 3180	Biomedical Ethics	3
PHIL 4176	Environmental Ethics	3
PSYC 1101	General Psychology	3
PSYC 2015	Research Methods	4
PSYC 2210	Social Psychology	3
PSYC 2220	Industrial/Organizational Psychology	3
PSYC 2230	Abnormal Psychology	3
PSYC 2240	Personality Theory	3
PSYC 2270	Introduction to Engineering Psychology	3
PSYC 3031	Experimental Analysis of Behavior	4
PSYC 4050	History and Systems	3
PSYC 4270	Psychological Testing	3
PUBP 3244	Stem Cell Science, Policy, and Ethics	3
PUBP 3600	Sustainability, Technology, and Policy	3
PUBP 4726	Privacy, Technology, Policy and Law	3
SLS 3110	Technology and Sustainable Community Development	3

Global Perspectives

Important Note:

On March 9, 2016, the Board of Regents of the University System of Georgia approved a revision to system-wide policies related to the Core Curriculum.

1. Institutions in the University System of Georgia will not be required to identify or track overlay requirements related to US Perspectives, Global Perspectives, and Critical Thinking.
2. Students will not be required to complete the overlay requirements from this point forward.
3. Students who are scheduled to graduate in the Spring 2016 Semester and who have not completed the overlays may graduate without fulfilling this requirement.

U.S. Perspectives

Important Note:

On March 9, 2016, the Board of Regents of the University System of Georgia approved a revision to system-wide policies related to the Core Curriculum.

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2. Students will not be required to complete the overlay requirements from this point forward.
3. Students who are scheduled to graduate in the Spring 2016 Semester and who have not completed the overlays may graduate without fulfilling this requirement.

Wellness

Wellness Requirement

All undergraduate students attending Georgia Tech must satisfactorily complete a wellness requirement.

Code	Title	Credit Hours
APPH 1040	Scientific Foundations of Health [1]	2
APPH 1050	The Science of Physical Activity and Health	2
APPH 1060	Flourishing: Strategies for Well-being and Resilience	2

[1] Previously offered as HPS 1040 (Health).

Credit, Tests, and Scores

- Advanced Levels (A-Levels)
- Advanced Placement Exams
- Advanced Standing
- Caribbean Advanced Proficiency Examinations (CAPE)
- Departmental Exams
- French Baccalaureat
- German Language Exams (DSD)
- International Baccalaureate Exams
- Regents' Testing Program
- ROTC Credit
- SAT II Subject Tests
- Seal of Biliteracy
- Transfer Courses with 'X' Numbers
- Transfer Credit

Advanced Levels (A-Levels)

Students entering Georgia Tech may receive college credit based upon their scores on the College Board Advanced Placement (AP) Exams taken in conjunction with designated high school advanced placement classes,

SAT II Subject Tests, The International Baccalaureate, Advanced Levels (A-Levels), and/or Georgia Tech Departmental Exams.

Once enrolled at Georgia Tech, students are not allowed to take College Board (Advanced Placement and SAT II), International Baccalaureate, or A-Level Examinations for credit. All examinations must be completed prior to the student's enrollment date. Students who offer satisfactory evidence that they are qualified to do so may receive credit for a course by examination at Georgia Tech. Such an examination is called an Examination for Advanced Standing.

Subject	Course	Hours
Biology	Grade: A = BIOS 1107/BIOS 1107L	4
Chemistry	Grade: A or B = CHEM 1310	4
Economics	Grade: A = ECON 2100	3
Math	Grade: A or B = MATH 1551	2
Physics	Grade: A = PHYS 2XXX	4

Georgia Tech does not grant credit for AS-Level or O-Level examination results.

Official transcript is required, provisional results will not be accepted.

Advanced Placement Exams

Students entering Georgia Tech may receive college credit based upon their scores on the College Board Advanced Placement (AP) Exams taken in conjunction with designated high school advanced placement classes, SAT II Subject Tests, The International Baccalaureate, and/or Georgia Tech Departmental Exams.

Once enrolled at Georgia Tech, students are not allowed to take College Board (Advanced Placement and SAT II), International Baccalaureate, or A-Level Examinations for credit. All examinations must be completed prior to the student's enrollment date. Students who offer satisfactory evidence that they are qualified to do so may receive credit for a course by examination at Georgia Tech. Such an examination is called an Examination for Advanced Standing.

****Please be aware that** BIOL 1510 **credit will be awarded as** BIOS 1107 **and** BIOS 1107L **effective Spring 2020.**

****Please be aware foreign language credit is only awarded with a score of 3 for First Year students starting 2020-2021.**

****Please be aware Spanish Literature & Culture with a score of 5 will only award SPAN 3050 for first year students starting 2022-2023.**

****Georgia Tech will accept the new African American Studies exam and award HTS 1XXX with a score of 4 or 5 in 2023.**

****Georgia Tech will accept the new Pre-Calculus exam and award** MATH 1113 **with a score of 4 or 5 in 2024.**

College Board Advanced Placement Exams

Subject	Course	Hours
African American Studies	AP Score: 4 or 5 = HTS 1XXX	3
Art History	AP Score: 4 or 5 ID 2242	3
Biology	AP Score: 4 or 5 = BIOS 1107 and BIOS 1107L	4
Mathematics - Calculus AB	AP Score: 4 or 5 = MATH 1551 [5]	2
Mathematics - Calculus BC	AP Score: 4 or 5 = MATH 1551 & MATH 1552[5]	6
Chemistry - Effective Summer 2010	AP Score: 4 = CHEM 1211K	4
Chemistry	AP Score: 5 = CHEM 1310	4
Chinese Language and Culture	AP Score: 3 = CHIN 1001 and CHIN 1002 [6]	8
	AP Score: 4 = CHIN 1002, CHIN 2001, and CHIN 2002	10
	AP Score: 5 = CHIN 2001, CHIN 2002, and CHIN 3XXX	9
Computer Science (A)	AP Score: 4 or 5 = CS 1301	3
Computer Science Principles	AP Score: 4 or 5 = CS 1XXX	3
English Language and Composition	AP Score: 4 or 5 = ENGL 1101	3
English Literature and Composition	AP Score: 4 or 5 = ENGL 1101	3
Environmental Science	AP Score: 4 or 5 = EAS 1600	4
European History	AP Score: 4 or 5 = HTS 1031	3
French Language and Culture	AP Score: 3 = FREN 1001 and FREN 1002 [6]	6
	AP Score: 4 = FREN 1002, FREN 2001, and FREN 2002	9
	AP Score 5 = FREN 2001, FREN 2002, and FREN 3XXX	9
German Language and Culture	AP Score: 3 = GRMN 1001 & GRMN 1002 [6]	6
	AP Score 4 = GRMN 1002, GRMN 2001, and GRMN 2002	9
	AP Score 5 = GRMN 2001, GRMN 2002, and GRMN 3XXX	9
Government and Politics: Comparative	AP Score: 4 or 5 = INTA 1200[3]	3

Government and Politics: U.S.	AP Score: 4 or 5 = POL 1101[3]	3
Human Geography	AP Score: 4 or 5 = SS 1XXX	3
Italian Language and Culture	No Credit Awarded	0
Japanese Language and Culture	AP Score: 3 = JAPN 1001 and JAPN 1002 [6]	8
	AP Score: 4 = JAPN 1002, JAPN 2001, and JAPN 2002	10
	AP Score: 5 = JAPN 2001, JAPN 2002, and JAPN 3001	9
Latin (Language and Culture)	AP Score: 4 or 5 = LATN 2XXX	6
Economics (Macroeconomics)[1]	AP Score: 4 or 5 = ECON 2105	3
Economics (Microeconomics)[1]	AP Score: 4 or 5 = ECON 2106	3
Music Theory	AP Score: 4 or 5 = MUSI 2700	3
Physics B	AP Score: 4 or 5 = PHYS 2XXX	3
Physics C, Part I: Mechanics	AP Score: 5 = PHYS 2211[4]	4
Physics C, Part II: Elect & Magnetism	AP Score: 5 = PHYS 2212[4]	4
Physics 1: Algebra-Based	AP Score: 4 or 5 = PHYS 2XXX	3
Physics 2: Algebra-Based	AP Score: 4 or 5 = PHYS 2XXX	3
Psychology	AP Score: 4 or 5 = PSYC 1101	3
Spanish Language & Culture	AP Score: 3 = SPAN 1001 & SPAN 1002 [6]	6
	AP Score: 4 = SPAN 1002, SPAN 2001, and SPAN 2002	9
	AP Score 5 = SPAN 2001, SPAN 2002, and SPAN 3XXX	9
Spanish Literature & Culture	AP Score: 3 = SPAN 1001 & SPAN 1002 [6]	6
	AP Score: 4 = SPAN 1002, SPAN 2001, and SPAN 2002	9
	AP Score: 5 = SPAN 2001, SPAN 2002, and SPAN 3050	9
Statistics	No Credit Awarded	0
Studio Art: 2-D Design	AP Score: 4 or 5 = ARCH 1XXX	3
Studio Art: 3-D Design	AP Score: 4 or 5 = ARCH 1XXX	3
Studio Art: Drawing	No Credit Awarded	0
United States (American) History	AP Score: 4 or 5 = HIST 2111	3
World History	AP Score: 4 or 5 = HTS 1XXX[2]	3

[1] With a score of 4 or 5 in both macroeconomics and microeconomics, a student could instead elect to receive 3 semester hours of credit for ECON 2100.

[2] HTS 1XXX represents a 1000 level elective course that may be used toward a social science requirement.

[3] Students cannot receive credit for both INTA 1200 and POL 1101.

[4] Students who receive a score of 4 will be contacted by the School of Physics after the AP scores are received (early in August each year) with information about taking a placement test to validate the credit. If students pass the test, they will be awarded credit.

[5] Subscores not accepted

[6] Language credit is only awarded with a score of 3 for First Year students starting 2020-2021

SAT II Subject Tests

International Baccalaureate

Advanced Standing

Examinations for Advanced Standing

1. Students who offer satisfactory evidence that they are qualified to do so may receive credit for a course by examination. Such an examination is called an "Examination for Advanced Standing."
2. Examinations for advanced standing require the recommendation of the department of instruction in which the course is offered, payment of the appropriate fee to the Office of the Bursar, and authorization by the Office of the Registrar.
3. Examinations for Advanced Standing will usually be offered during the Final Examination Period.
4. A student will not be allowed to take an Examination for Advanced Standing in a given course more than twice.
5. Students will not be allowed to take an Examination for Advanced Standing in a course for which any prerequisite has not been met, except with the consent of the school offering the course.
6. An Examination for Advanced Standing will be reported with an "S" or "U" grade. Neither grade will be included in the calculation of grade-point average (GPA).
7. Advanced standing is not allowed for laboratory or studio classes, except with the consent of the school offering the course.
8. Students may not use more than nine credits of advanced standing to meet degree requirements.
9. The School of Modern Languages does not offer Advanced Standing examinations, although students may receive advanced standing credit for up two modern languages courses in the same language of study for a total of 6 to 8 credits upon successful completion (with a C or higher) of coursework as outlined in numbers 4 and 5 below. The only courses for which Advanced Standing credit may be given are 1001, 1002, 2001, and/or 2002 in the languages currently offered in

the School of Modern Languages at Georgia Tech. No 3000- or 4000-level Advanced Standing credit will be granted.

For students seeking Advanced Standing Credit for 1 course (3-4 credits), there are four options:

Advanced Standing Credit	Required course(s) to successfully complete (with a grade of C or higher) before applying	
1001	1002	2001
1002	2001	N/A
2001	2002	N/A
2002	3XXX or 4XXX	N/A

For students seeking Advanced Standing Credit for 2 courses (6-8 credits), there are three options:

Advanced Standing Credit		Required course(s) to successfully complete (with a grade of C or higher) before applying	
1001	1002	2001	2002
1002	2001	2002	3XXX or 4XXX
2001	2002	3XXX or 4XXX	3XXX or 4XXX

Advanced Standing Form

Departmental Exams

Advanced Placement in Mathematics

The School of Mathematics will offer optional GT advanced placement mathematics examinations to incoming freshmen who wish to test out of MATH 1113, MATH 1551 (Differential Calculus), MATH 1552 (Integral Calculus) and/or MATH 1553 (Intro to Lineal Algebra).

If a student already has GT credit for MATH 1551 the student does not have to take the optional GT Advanced Placement exam for MATH 1551. Such a student may elect to take the optional GT Advanced Placement exam for MATH 1552.

French Baccalaureat

Students entering Georgia Tech may receive college credit based upon their scores on the College Board Advanced Placement (AP) Exams taken in conjunction with designated high school advanced placement classes, SAT II Subject Tests, The International Baccalaureate, Advanced Levels (A-Levels), and/or Georgia Tech Departmental Exams.

Once enrolled at Georgia Tech, students are not allowed to take College Board (Advanced Placement and SAT II), International Baccalaureate, or A-Level Examinations for credit. All examinations must be completed prior to the student's enrollment date. Students who offer satisfactory evidence that they are qualified to do so may receive credit for a course by examination at Georgia Tech. Such an examination is called an Examination for Advanced Standing.

Subject	Score	Course
Scientifique Math[1,2]	10 or higher with coefficient of 4 or higher	MATH 1551 & MATH 1552
English Language & Literature[1,2]	16 or higher	ENGL 1101
History - Geography	14 or higher	HTS 1XXX (3 semester hours)
Earth Life Science	16 or higher	BIOS 1107 and BIOS 1107L

[1] Effective for the 2019-20 Catalog Year.

[2] Students must bring French Baccalauréat transcript to the Registrar's Office for evaluation.

German Language Exams (DSD)

Students entering Georgia Tech may receive college credit based upon their scores on the College Board Advanced Placement (AP) Exams taken in conjunction with designated high school advanced placement classes, SAT II Subject Tests, The International Baccalaureate, Advanced Levels (A-Levels), and/or Georgia Tech Departmental Exams.

Once enrolled at Georgia Tech, students are not allowed to take College Board (Advanced Placement and SAT II), International Baccalaureate, or A-Level Examinations for credit. All examinations must be completed prior to the student's enrollment date. Students who offer satisfactory evidence that they are qualified to do so may receive credit for a course by examination at Georgia Tech. Such an examination is called an Examination for Advanced Standing.

Subject	Course	Credits
DSD I[1,2]	GRMN 3XXX	3
DSD II[1,2]	GRMN 3XXX	6

[1] Effective for the 2019-20 Catalog Year.

[2] Students must bring Deutsches Sprachdiplom transcript to the Registrar's Office for evaluation.

International Baccalaureate Exams

Students entering Georgia Tech may receive college credit based upon their scores on the College Board Advanced Placement (AP) Exams taken in conjunction with designated high school advanced placement classes, SAT II Subject Tests, The International Baccalaureate, and/or Georgia Tech Departmental Exams.

Once enrolled at Georgia Tech, students are not allowed to take College Board (Advanced Placement and SAT II), International Baccalaureate, or A-Level Examinations for credit. All examinations must be completed prior to the student's enrollment date. Students who offer satisfactory evidence that they are qualified to do so may receive credit for a course by examination at Georgia Tech. Such an examination is called an Examination for Advanced Standing.

**Please note: The awarded credit for BIOL 1510 and BIOL 1520 will be updated to BIOS 1107 and BIOS 1107L and BIOS 1108 and BIOS 1108L effective Spring 2020.
**Effective 2020-21, credit for High Level Physics will be PHYS 2XXX (4 credits). Georgia Tech will no longer award credit for PHYS 2211 and PHYS 2212.
**Note: Changes to Modern Languages credits are for first year students entering 2020-21.
**Note: Credit not awarded for Cantonese exams.
**Note: Addition of Film credits is for first-year students entering 2022-23.
*Exam credit awarded if completed prior to August 2019 (applies to Mathematics Standard and High Level)

International Baccalaureate - High Level A (Foreign Language courses)

Subject	Higher Level Exam Scores	Credit
Arabic	5	9 hours (ARBC 2001, ARBC 2002, and ARBC 3XXX)
	6 or higher	9 hours (ARBC 2002, ARBC 3XXX, and ARBC 3XXX)
Chinese	5	9 hours (CHIN 2001, CHIN 2002, and CHIN 3XXX)
	6 or higher	9 hours (CHIN 2002, CHIN 3XXX, and CHIN 3XXX)
French	5	9 hours (FREN 2001, FREN 2002, and FREN 3XXX)
	6 or higher	9 hours (FREN 2002, FREN 3XXX, and FREN 3XXX)
German	5	9 hours (GRMN 2001, GRMN 2002, GRMN 3XXX)
	6 or higher	9 hours (GRMN 2002, GRMN 3XXX and GRMN 3XXX)
Hindi	5	9 hours (HIN 2001, HIN 2002, and HIN 3XXX)
	6 or higher	9 hours (HIN 2002, HIN 3XXX, and HIN 3XXX)
Japanese	5	9 hours (JAPN 2001, JAPN 2002, and JAPN 3001)
	6 or higher	9 hours (JAPN 2002, JAPN 3001, and JAPN 3XXX)
Korean	5	9 hours (KOR 2001, KOR 2002, and KOR 3XXX)
	6 or higher	9 hours (KOR 2002, KOR 3XXX, and KOR 3XXX)
Persian	5	9 hours (PERS 2001, PERS 2002, and PERS 3XXX)
	6 or higher	9 hours (PERS 2002, PERS 3XXX, and PERS 3XXX)
Portuguese	5	9 hours (PORT 2001, PORT 2002, and PORT 3XXX)
	6 or higher	9 hours (PORT 2002, PORT 3XXX, and PORT 3XXX)
Russian	5	9 hours (RUSS 2001, RUSS 2002, and RUSS 3XXX)
	6 or higher	9 hours (RUSS 2002, RUSS 3XXX, and RUSS 3XXX)
Spanish	5	9 hours (SPAN 2001, SPAN 2002, and SPAN 3XXX)
	6 or higher	9 hours (SPAN 2002, SPAN 3XXX, and SPAN 3XXX)

International Baccalaureate - High Level B (Foreign Language courses)

Subject	Higher Level Exam Scores	Credit
Arabic	4	8 hours (ARBC 1001 and ARBC 1002)
	5	10 hours (ARBC 1002, ARBC 2001, ARBC 2002)
	6 or higher	9 hours (ARBC 2001, ARBC 2002, and ARBC 3XXX)
Chinese	4	8 hours (CHIN 1001 and CHIN 1002)
	5	10 hours (CHIN 1002, CHIN 2001 or CHIN 2002)
	6 or higher	9 hours (CHIN 2001, CHIN 2002, and CHIN 3XXX)
French	4	6 hours (FREN 1001, and FREN 1002)
	5	9 hours (FREN 1002, FREN 2001, and FREN 2002)
	6 or higher	9 hours (FREN 2001, FREN 2002, and FREN 3XXX)
German	4	6 hours (GRMN 1001 and GRMN 1002)
	5	9 hours (GRMN 1002, GRMN 2001, and GRMN 2002)
	6 or higher	9 hours (GRMN 2001, GRMN 2002, and GRMN 3XXX)

Hindi	4	6 hours (HIN 1001 and HIN 1002)
	5	9 hours (HIN 1002, HIN 2001, and HIN 2002)
	6 or higher	9 hours (HIN 2001, HIN 2002, and HIN 3XXX)
Japanese	4	8 hours (JAPN 1001, and JAPN 1002)
	5	10 hours (JAPN 1002, JAPN 2001, JAPN 2002)
	6 or higher	9 hours (JAPN 2001, JAPN 2002, and JAPN 3001)
Korean	4	8 hours (KOR 1001 and KOR 1002)
	5	10 hours (KOR 1002, KOR 2001, and KOR 2002)
	6 or higher	9 hours (KOR 2001, KOR 2002, and KOR 3XXX)
Persian	4	8 hours (PERS 1001 and PERS 1002)
	5	10 hours (PERS 1002, PERS 2001, and PERS 2002)
	6 or higher	9 hours (PERS 2001, PERS 2002, and PERS 3XXX)
Portuguese	4	6 hours (PORT 1001 and PORT 1002)
	5	9 hours (PORT 1002, PORT 2001, and PORT 2002)
	6 or higher	9 hours (PORT 2001, PORT 2002, and PORT 3XXX)
Russian	4	8 hours (RUSS 1001 and RUSS 1002)
	5	10 hours (RUSS 1002, RUSS 2001, and RUS 2002)
	6 or higher	9 hours (RUSS 2001, RUSS 2002, and RUSS 3XXX
Spanish	4	6 hours (SPAN 1001 and SPAN 1002)
	5	9 hours (SPAN 1002, SPAN 2001, and SPAN 2002)
	6 or higher	9 hours (SPAN 2001, SPAN 2002, and SPAN 3XXX)

International Baccalaureate - Standard Level A (Foreign Language courses)

Subject	Standard Level Exam Scores	Credit
Arabic	4	8 hours (ARBC 1001 and ARBC 1002)
	5	11 hours (ARBC 1001, ARBC 1002, and ARBC 2001)
	6	10 hours (ARBC 1002, ARBC 2001, and ARBC 2002)
	7 or higher	9 hours (ARBC 2001, ARBC 2002, and ARBC 3XXX)
Chinese	4	8 hours (CHIN 1001 and CHIN 1002)
	5	11 hours (CHIN 1001, CHIN 1002, and CHIN 2001)
	6	10 hours (CHIN 1002, CHIN 2001, and CHIN 2002)
	7 or higher	9 hours (CHIN 2001, CHIN 2002, and CHIN 3XXX)
French	4	6 hours (FREN 1001 and FREN 1002)
	5	9 hours (FREN 1001, FREN 1002, and FREN 2001)
	6	9 hours (FREN 1002, FREN 2001, and FREN 2002)
	7 or higher	9 hours (FREN 2001, FREN 2002, and FREN 3XXX)
German	4	6 hours (GRMN 1001 and GRMN 1002)
	5	9 hours (GRMN 1001, GRMN 1002, and GRMN 2001)
	6	9 hours (GRMN 1002, GRMN 2001, and GRMN 2002)
	7 or higher	9 hours (GRMN 2001, GRMN 2002, and GRMN 3XXX)
Hindi	4	6 hours (HIN 1001 and HIN 1002)
	5	9 hours (HIN 1001, HIN 1002, and HIN 2001)
	6	9 hours (HIN 1002, HIN 2001, and HIN 2002)

	7 or higher	9 hours (HIN 2001, HIN 2002, and HIN 3XXX)
Japanese	4	8 hours (JAPN 1001 and JAPN 1002)
	5	11 hours (JAPN 1001, JAPN 1002, and JAPN 2001)
	6	10 hours (JAPN 1002, JAPN 2001, and JAPN 2002)
	7 or higher	9 hours (JAPN 2001, JAPN 2002, and JAPN 3001)
Korean	4	8 hours (KOR 1001 and KOR 1002)
	5	11 hours (KOR 1001, KOR 1002, and KOR 2001)
	6	10 hours (KOR 1002, KOR 2001, and KOR 2002)
	7 or higher	9 hours (KOR 2001, KOR 2002, and KOR 3XXX)
Persian	4	8 hours (PERS 1001 and PERS 1002)
	5	11 hours (PERS 1001, PERS 1002, and PERS 2001)
	6	10 hours (PERS 1002, PERS 2001, and PERS 2002)
	7 or higher	9 hours (PERS 2001, PERS 2002, and PERS 3XXX)
Portuguese	4	6 hours (PORT 1001 and PORT 1002)
	5	9 hours (PORT 1001, PORT 1002, and PORT 2001)
	6	9 hours (PORT 1002, PORT 2001, and PORT 2002)
	7 or higher	9 hours (PORT 2001, PORT 2002, and PORT 3XXX)
Russian	4	8 hours (RUSS 1001 and RUSS 1002)
	5	11 hours (RUSS 1001, RUSS 1002, and RUSS 2001)
	6	10 hours (RUSS 1002, RUSS 2001, and RUSS 2002)
	7 or higher	9 hours (RUSS 2001, RUSS 2002, and RUSS 3XXX)
Spanish	4	6 hours (SPAN 1001 and SPAN 1002)
	5	9 hours (SPAN 1001, SPAN 1002, and SPAN 2001)
	6	9 hours (SPAN 1002, SPAN 2001, and SPAN 2002)
	7 or higher	9 hours (SPAN 2001, SPAN 2002, and SPAN 3XXX)

International Baccalaureate - Standard Level B (Foreign Language courses)

Subject	Standard Level Exam Scores	Credit
Arabic	5	8 hours (ARBC 1001, and ARBC 1002)
	6 or higher	10 hours (ARBC 1002, ARBC 2001, and ARBC 2002)
Chinese	5	8 hours (CHIN 1001, and CHIN 1002)
	6 or higher	10 hours (CHIN 1002, CHIN 2001, and CHIN 2002)
Foreign Language	6 or higher	3 hours (1002)
French	5	6 hours (FREN 1001 and FREN 1002)
	6 or higher	9 hours (FREN 1002, FREN 2001, and FREN 2002)
German	5	6 hours (GRMN 1001 and GRMN 1002)
	6 or higher	9 hours (GRMN 1002, GRMN 2001, and GRMN 2002)
Hindi	5	6 hours (HIN 1001 and HIN 1002)
	6 or higher	9 hours (HIN 1002, HIN 2001, and HIN 2002)
Japanese	5	9 hours (JAPN 1001 and JAPN 1002)
	6 or higher	10 hours (JAPN 1002, JAPN 2001, and JAPN 2002)
Korean	5	8 hours (KOR 1001 and KOR 1002)
	6 or higher	10 hours (KOR 1002, KOR 2001, and KOR 2002)
Persian	5	8 hours (PERS 1001 and PERS 1002)
	6 or higher	10 hours (PERS 1002, PERS 2001, and PERS 2002)

Portuguese	5	6 hours (PORT 1001 and PORT 1002)
	6 or higher	9 hours (PORT 1002, PORT 2001, and PORT 2002)
Russian	5	8 hours (RUSS 1001 and RUSS 1002)
	6 or higher	10 hours (RUSS 1002, RUSS 2001, and RUSS 2002)
Spanish	5	6 hours (SPAN 1001 and SPAN 1002)
	6 or higher	9 hours (SPAN 1002, SPAN 2001, and SPAN 2002)

International Baccalaureate - High Level

Subject	Higher Level Exam Scores	Credit
Africa and the Middle East	5 or higher	HTS 2XXX
Asia and Oceania	5 or higher	HTS 2XXX
Biology	4 or 5	4 hours (BIOS 1107, BIOS 1107L)
	6 or higher	8 hours (BIOS 1107, BIOS 1107L, BIOS 1108, BIOS 1108L)
Chemistry	5 or higher	4 hours (CHEM 1310)
Computer Science	5 or higher	3 hours (CS 1301)
Economics	5 or higher	3 hours (ECON 2100)
English	4 or higher	3 hours (ENGL 1101)
European History	5 or higher	3 hours (HTS 2037)
Film	7	LMC 3406
History of Americas	5 or higher	3 hours (HIST 2112)
Mathematics	5 or higher	2 hours (MATH 1551)*
Mathematics A&A	6 or higher	2 hours (MATH 1551)
Mathematics A&I	6 or higher	No credit
Physics	7	4 hours (PHYS 2XXX)
Psychology	5 or higher	3 hours (PSYC 1101)

International Baccalaureate - Standard Level

Subject	Standard Level Exam Scores	Credit
Biology	6 or higher	4 hours (BIOS 1107, BIOS 1107L)
Chemistry	6 or higher	4 hours (CHEM 1XXX)
Computer Science	6 or higher	3 hours (CS 1XXX)
Economics	6 or higher	3 hours (ECON 1XXX)
English	6 or higher	3 hours (ENGL1101)
European History	6 or higher	3 hours (HTS 1XXX)
Film	6 or higher	LMC 2500
History of Americas	6 or higher	3 hours (HTS 1XXX)
Mathematics	5 or higher	2 hours (MATH 1551)*
Mathematics A&I	5 or higher	No credit
Mathematics A&A	5 or higher	No credit
Physics	6 or higher	No Credit
Psychology	6 or higher	3 hours (PSYC 1XXX)

SAT II Subject Tests

Advanced Placement

Regents' Testing Program

Effective Spring 2010

The Regents' exam is no longer required at Georgia Tech as a result of a recent decision by The Board of Regents'.

ROTC Credit

Georgia Tech offers three voluntary ROTC programs: Army, Navy, and Air Force.

Depending on the student's major, Basic and Advanced ROTC classes count as a portion of elective credit. (Students may apply a maximum of 4 credit hours in Basic ROTC courses and six credit hours in Advanced ROTC courses toward meeting the elective requirements for any degree at the discretion of the school.) Consult specific colleges to determine the amount of hours that will count toward a degree. After earning a baccalaureate degree and completing the Advanced ROTC courses for any of the three services, a student may receive a commission as an officer in either the reserve or active forces.

Students accepted into the program earn more than just money for a college degree. Cadets and midshipmen receive training and experience in the one quality which is always in great demand: Leadership.

Students may apply a maximum of 4 credit hours in basic (1000-2000 level courses) ROTC courses and six hours in advanced (3000-4000 level) ROTC courses toward meeting the free elective requirements for any degree. Students should begin taking basic ROTC courses during the first term they are enrolled. For further information, see individual curricula for the schools. Please note some departments may have stricter guidelines regarding ROTC courses.

Airforce ROTC Information

Army ROTC Information

Navy ROTC Information

ROTC Credit

Air Force ROTC Website

Army ROTC Website

Navy ROTC Website

SAT II Subject Tests

Students entering Georgia Tech may receive college credit based upon their scores on the College Board Advanced Placement (AP) Exams taken in conjunction with designated high school advanced placement classes, SAT II Subject Tests, The International Baccalaureate, and/or Georgia Tech Departmental Exams.

Once enrolled at Georgia Tech, students are not allowed to take College Board (Advanced Placement and SAT II), International Baccalaureate,

or A-Level Examinations for credit. All examinations must be completed prior to the student's enrollment date. Students who offer satisfactory evidence that they are qualified to do so may receive credit for a course by examination at Georgia Tech. Such an examination is called an Examination for Advanced Standing.

****Note: On January 19th, 2021, College Board announced they would no longer be offering SAT Subject Test in the United States and internationally after June 2021. Georgia Tech will accept existing SAT II scores and those completed in 2021 until 2026.**

The table below describes the course credit a student may earn if they achieve a specific score on a specific SAT II Subject Test.

Subject	Score	Semester Course	Hours
Chemistry	680	CHEM 1211K	4
Chemistry	730	CHEM 1310	4
Literature	750	HUM 1XXX	3
U.S. History	710	HIST 2111	3
World History	710	HTS 1XXX	3

Advanced Placement

International Baccalaureate

Transfer Courses with 'X' Numbers

Transfer courses for which there is no exact Georgia Tech equivalent will be listed with the numbers 1XXX, 2XXX, etc. Courses so numbered can be used as free electives or may be substituted for Georgia Tech courses at the discretion of the academic unit. Transfer courses with an "X" as the secord or third number of the course (e.g., MATH 15X2) are lacking a component of the Georgia Tech course. These courses, in combination with another Georgia Tech course, may be considered as equivalent for prerequisite checking and degree requirements. Students should seek advisement from their academic unit regarding the use of these courses toward fulfilling degree requirements.

Transfer Credit

The basic policy regarding the acceptance of courses by transfer is to allow credit for courses completed with satisfactory grades ("C" or better) at other accredited colleges and universities in the United States and Canada, provided the courses correspond in time and content to courses offered at Georgia Tech. The Institute will not accept credit for courses successfully completed at another institution but previously taken at Georgia Tech unless the final grade received at Georgia Tech is a "W." The student must request and file an official transcript of transfer courses before the Institute can award credit. Coursework completed at colleges and universities outside the United States and Canada will be evaluated on a case-by-case basis. Transfer credit is not calculated in the Georgia Tech grade-point average.

Students may attend another institution as a transient student during terms when not enrolled at Georgia Tech. Students should discuss their course selection with their academic advisor to ensure transferability and applicability toward their degree programs. With the exception of officially sanctioned cross-enrolled programs, students are not to be enrolled at Georgia Tech and another institution during the same term without the specific approval the Institute Undergraduate Curriculum Committee or Institute Graduate Curriculum Committee, as appropriate.

Transfer Credit Policy

Policy on Transfer Credit

1. Only official transcripts from other schools may be used to evaluate and/or award credit.
   - **New students** must request that an official transcript from all previously attended colleges and universities be mailed to the Admissions Office.
   - Georgia Institute of Technology
     Undergraduate Admissions Office
     Atlanta, GA 30332-0320
   - **Current or previously enrolled Georgia Tech students** must have an official transcript from all other colleges and universities mailed to:
   - Georgia Institute of Technology
     Office of the Registrar
     Transfer Credit
     Atlanta, GA 30332-0320
2. The basic policy regarding the acceptance of the courses by transfer is to allow credit for courses completed with satisfactory grades (C or better) in other accredited colleges provided the courses correspond in time and content to courses offered at the Georgia Institute of Technology. Georgia Tech assumes responsibility for the academic quality of any work or credit recorded on the institution's transcript. Transfer credits will be accepted from newly-formed institutions of the University System of Georgia prior to accreditation.
3. Georgia Tech will not award credit for courses successfully completed at another institution which were previously taken at Georgia Tech.
4. A petition to the faculty must be approved to use course work more than ten years old.
5. Georgia Tech reserves the right to test the proficiency of any student in course work transferred from other institutions and to disallow credit in courses in which the student cannot demonstrate acceptable proficiency.

Transfer Credit for Online Courses

Georgia Tech accepts credit for coursework as listed on the transfer equivalency table online at oscar.gatech.edu.

Requesting Transfer Credit for Courses Not Previously Evaluated

1. Check the online equivalency database for updates. New evaluations are posted daily.
2. Notify the Office of the Registrar's Transfer Credit Department of any not-awarded credit. Send an email to comments@registrar.gatech.edu
3. Using the Transfer Credit web site, submit courses for evaluation.

About Transfer Credit

1. Georgia Tech does not offer correspondence courses and does not grant credit for correspondence courses taken at other institutions. Academic units reserve the right to take such things as delivery method into consideration. For example, on-line courses and computer-instructed courses may not be accepted by some academic units for credit.
2. Georgia Tech does not grant credit for the College Level General Educational Development Tests, CLEP, USAFI courses, or courses

completed at any United States armed services, with the exception of the military academies and schools with full accreditation.

3. Georgia Tech does not grant credit for professional certificate programs.
4. The following items are among other circumstances in which non-resident credit is not granted:
   - Courses previously completed at Georgia Tech.
   - College courses taken to meet freshman admissions requirements.
   - Remedial courses.
   - Courses basically secondary school or pre-college level.
   - Courses with essentially non-academic content.
   - Vocational courses.
   - Learning support courses.
5. Non-resident credit is not computed as a part of the student's grade point average at Georgia Tech.

Advanced Placement (AP) and International Baccalaureate (IB)

For Advanced Placement (AP), visit the Advanced Placement page for more information.

For International Baccalaureate (IB), visit the International Baccalaureate page for more information.

Note: Once enrolled at Georgia Tech, students are not allowed to take College Board (Advanced Placement and SAT II), International Baccalaureate or A-Level Examinations for credit. All examinations must be completed prior the student's enrollment date. Students who offer satisfactory evidence that they are qualified to do so may receive credit for a course by examination at Georgia Tech. Such an examination is called an "Examination for Advanced Standing."

More information:

Transfer Equivalency Catalog

Undergraduate Students Taking Graduate Courses

A senior with a grade-point average (GPA) of at least 2.7 may enroll in a graduate course if the student obtains permission from the school or department offering the course.

Up to twelve credit hours earned as an undergraduate student may count toward earning a master's degree if the following conditions are satisfied:

1. The student was in residence at Georgia Tech for at least two semesters before registering for the course(s).
2. The student did not use the course(s) toward a bachelor's degree. Special exceptions may apply, as described below. Students may use either option but cannot combine options listed below.
   a. Graduate Course Option
      i. If a student pursues both a bachelor's and master's at Georgia Tech, and if both degrees are in the same discipline, they may apply up to six credit hours of graduate-level credit to satisfying the requirements for both degrees while still completing all other requirements for the bachelor's and master's degrees. Because some master's degree programs do not have a unique undergraduate counterpart program, and because some master's programs are offered by several schools, the definition of "discipline" will be broadly interpreted in such cases. To qualify for this option, a student must complete the bachelor's degree with a cumulative grade-point average (GPA) of 3.5 or higher and must complete the master's degree within a two-year period following the award date of the bachelor's degree.
   b. BSMS Option
      i. The BSMS Options are formalized Graduate Course Option agreements between an undergraduate program and graduate program. These options allow a maximum of 6 hours that can be applied toward the bachelor's degree program and the master's program. These options include their own admission criteria into the master's program and their own GPA requirements. They also typically include research and mentoring components for eligible students. Students still must complete all requirements for the bachelor's and master's program. The master's degree must be completed within a two-year period following the award date of the bachelor's degree.

         See BS/MS Options for specific BS/MS Option information regarding specific admission requirements, GPA requirements and which courses may be eligible to share between a bachelor's degree and master's degree.

Undergraduate-Level Courses

Undergraduate Minors

Undergraduate Minor Guidelines

An undergraduate minor is a defined program of study outside the student's major field. Minors are intended to broaden the student's education by encouraging and officially recognizing knowledge obtained by the student in fields other than their major.

Minors are typically offered by Schools which also offer a major. A program of study for the minor is outlined and it may include more than one option or "track". Tracks allow students to focus on an aspect of the academic field that is of particular interest to them. It is expected that there will be depth of the program of study and that specific educational objectives will be met upon completion of the minor.

Other minors are offered where there is no undergraduate degree granting program at Georgia Tech. These minors cover fields which are inherently multidisciplinary; i.e., ones that are covered in part by multiple degree granting academic programs. Multidisciplinary minors require particularly broad Programs of Study which include courses from multiple Schools and/or Colleges.

Undergraduate Minors Offered

Click here for a list of minors offered at Georgia Tech. All undergraduate minor requirements are also available in DegreeWorks.

Program of Study

The program of study for each minor must satisfy the curricular requirements listed below. However, some minors, at the discretion of the offering academic unit(s) and approval from the Institute Curriculum Committee, may be exempt from some of these requirements, may exceed some requirements, and/or add additional requirements. Consult

the advisor for the minor program for the specific requirements of that minor.

Requirements for the Program of Study

1. A minor program of study must have at least 15 credit hours of coursework.
2. A minor program of study must include at least 9 credit hours of courses numbered 3000 or above.
3. Courses used to satisfy Core Areas A through E in a student's major degree program cannot also be used to satisfy the course requirements for a minor.
4. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.
5. All academic units may designate a block/blocks of courses outside of the student's major field of study in which the same course can be used to satisfy the course requirements in the student's major degree program and also be used to satisfy the course requirements for a minor.
6. A multidisciplinary or other minor may contain courses in a student's major field of study. A maximum of 6 credit hours of such courses may be used to satisfy the course requirements for the minor, provided these courses are not also used to satisfy any course requirement in the student's major degree program.
7. A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or Undergraduate Research. Students may not use 6 credit hours of either Special Problems or Undergraduate Research for a minor.
8. A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
9. A course may not be used to satisfy the requirements of more than one minor or certificate.
10. All courses counting toward the minor must be taken on a letter-grade basis.
11. All courses used to satisfy the course requirements for a minor must be completed with a grade of C (2.00) or better.

Other Guidelines

1. A student should select a minor in consultation with an advisor in their major field of study. The minor selected must be:
   a. outside of the student's major, or
   b. a multidisciplinary minor that may include some courses in the student's major field of study. (See requirement #6 above.)
2. The student should also consult with an advisor in the minor field of study who can inform and advise the student about the specific requirements of the minor. Some of these may be different than the requirements listed above.
3. Students can declare a minor at any time. However, it is recommended that students declare the minor as soon as they have made the decision so that they can monitor their progress using the online degree audit and with their advisor. Declaration of the minor also provides information to the relevant academic units that is helpful in planning courses. The minor declaration form is on the Registrar's Office website at: http://www.registrar.gatech.edu/students/formlanding/changeminor.php.
4. The student must complete a minor program of study form at the same time the online application for graduation is completed, generally during the semester before the terminal one. Program of study forms for all minors can be found here.
5. The minor is conferred at the same time the major degree is conferred. The major degree and minor will be recorded on the student's transcript. The minor will not appear on the student's diploma.
6. Minors will not be conferred retroactively upon students who have graduated.

Administrative Guidelines

1. All proposals for a minor must originate from the faculty of the academic unit(s) offering the minor. Minors may originate in several ways, such as:
   a. a minor in a field in which Georgia Tech offers a degree program through a single academic unit (College/School),
   b. a multidisciplinary minor, in which the subject matter is covered by multiple degree granting academic programs in multiple academic units (Colleges/Schools),
   c. a minor in a field in which there is no undergraduate degree-granting program at Georgia Tech. In this case, the proposed minor must be in a recognized academic field or discipline and the offering academic unit(s) must have in place sufficient courses, faculty, and facilities.
2. All proposals for a minor must include a statement of the educational objectives of the minor and how the program of study is used to satisfy these objectives.
3. The academic unit(s) offering the minor may choose to require an admission process, set admission standards, and/or set enrollment limits.
4. The academic units(s) offering the minor may request to be exempted from some of the curricular requirements applied to the program of study or add additional requirements if this is justified as essential to meeting the stated educational objectives of the minor.
5. For a multidisciplinary or other minor, a maximum of 6 semester hours of courses in the student's major field of study may be used to satisfy the course requirements for a minor when their inclusion is justified as essential to meeting the stated educational objectives of the minor. However, these courses cannot also be used to satisfy any course requirement in the student's major degree program unless they belong to the special block of courses described in requirement #5 of the Requirements for the Program of Study of the minor.
6. All proposals for a minor must include a plan for advising students pursuing the minor and for approving a student's completion of the required program of study.
7. All proposals for a minor must be endorsed by the appropriate College Dean(s) and by the Provost.
8. All undergraduate minors must be approved by the Institute Undergraduate Curriculum Committee and by the Academic Senate.
9. Information and relevant documents for proposing a new minor can be found at http://www.icc.gatech.edu/submit/requirements.php?type=101

ADMISSIONS

- Undergraduate Admissions
- Graduate Admissions
- Recruitment

Graduate Admissions

Prospective students may obtain information and apply for admission via the Graduate Education website. The site provides information regarding minimum admission standards and relevant deadlines for individual programs.

Applicants for Georgia Tech's graduate programs should hold a bachelor's degree from an accredited institution and be able to demonstrate academic excellence. Students should also be able to demonstrate experience with their selected field of graduate studies such as an undergraduate degree in the field or work experience in a related job.

- Admissions Information
- Deferring an Application
- English Proficiency for International Students
- Graduate Record Exam (GRE)
- Orientation - New Students
- Readmission
- Transfer of Credit
- Types of Standing

Admissions Information

Anyone who is qualified is welcome to seek admission to Georgia Tech, and anyone who applies for and accepts admission can be confident that the policy and regular practice of the Institute will not discriminate against him or her on the basis of race, religion, sex, or national origin.

Verification of credentials and certification of compliance with Institute admissions policies shall be the responsibility of the Office of Graduate Education. Policies and procedures that are approved by the Office of the President, Board of Regents of the University System of Georgia, and the Academic Faculty Senate of the Institute shall be applied in determining eligibility. From those eligible candidates, final admission decisions shall be the responsibility of the admitting department. Satisfying minimal standard does not guarantee admission, since the number of eligible applicants generally far exceeds the number of places available. As a result, many well-qualified applicants cannot be accommodated.

The criteria used in determining each applicant's eligibility for consideration shall include:

1. Evidence of award of a bachelor's degree, its equivalent, or higher degree (prior to matriculation) from a regionally accredited institution; demonstrated academic excellence; and evidence of experience in the selected field of graduate study.
2. For international applicants, a satisfactory score on one of the following: Test of English as a Foreign Language (TOEFL), International English Language Testing System Academic (IELTS Academic) test, the Georgia Tech Language Institute (GTLI) English Proficiency Assessment, or GTLI Upper Advanced 700 Level.

Departments make final admission decisions from the pool of eligible candidates based on a combination of factors, including academic degrees and records, the statement of purpose, letters of recommendation, test scores, and relevant work experience. Departments may also consider the appropriateness of the applicant's goals to the degree program in which they are interested and to the research interests of the program's faculty. In addition, consideration may be given to how the applicant's background and life experience would contribute significantly to an educationally beneficial mix of students.

Graduate Record Examinations (GRE)

Official GRE general test scores are required by most graduate programs and GRE subject test scores are required for some programs. Check the Graduate Education Degree Program page for test requirements in specific programs.

Orientation - New Students

All new graduate students should plan to attend one of the Institute's orientation sessions and should be familiar with the broader set of onboarding programs and resources available to them. In some cases, individual programs will also hold program orientations. New students should plan to attend both the Institute and the program orientations, as the same information is not covered in these separate sessions.

An extended orientation program, GT6000, is also recommended for new graduate students. This program is led by experienced graduate students and introduces new students to campus resources, builds community, and provides peer mentoring for new graduate students.

Deferring an Application

An applicant wishing to defer an application to a subsequent semester must first consult with the admitting graduate program to determine if the program admits students for that semester. An applicant may submit a one-time request to their admitting program, as long as the request meets the program's deadline and occurs prior to the start of the original semester of matriculation. If the admitting program agrees to the applicant's request for a deferral, the applicant may select a term no more than 3 semesters from the original semester of matriculation. Deferred applications are referred to the graduate program for reconsideration and a new admissions decision. Graduate programs may refuse admission to applicants 1) whose application is incomplete (e.g. missing documents) after the start of the semester of original matriculation and 2) when the applicants have not requested deferrals to future semesters. If an applicant has not requested a deferral prior to the start of the original semester of matriculation, the applicant must submit a new application and application fee for the future semester.

Readmission

Students who interrupt the continuity of their graduate programs by not registering for three or more consecutive terms must seek readmission by filing a completed Request for Readmission form with the Registrar. Individuals who have received a graduate degree from Georgia Tech and who wish to reenter to receive an additional graduate degree (at the same level or higher) must confirm with the new major department whether or not a new application is necessary or if the student may apply through Readmission. Readmission forms are available from the Office of the Registrar. For more information, see the policy for withdrawal and readmission.

Students who have been out three or more terms will be required to meet health, lawful presence, and other certification requirements in effect at the time of readmission.

Transfer of Credit

A student may not apply for transfer credit until after matriculation at Georgia Tech. The courses to be transferred would typically be those appearing on the approved program of study form for the masters degree. A doctoral student normally does not request transfer credit. The rules relative to and the process for obtaining transfer of credit for graduate-level courses are as follows:

1. Student's in a master's degree program requiring fewer than 33 semester credit hours may receive up to six hours of transfer credit for graduate-level courses taken at an institution accredited by a Canadian or U.S. regional accrediting board, or at a foreign school or university that has a signed partner agreement with Georgia Tech, and not used for credit toward another degree.
   A student in a master's degree program requiring 33 semester credit hours or more may receive up to nine hours of transfer credit for graduate-level courses taken at an institution accredited by a Canadian or U.S. regional accrediting board, or at a foreign school or university that has a signed partner agreement with Georgia Tech, and not used for credit toward another degree. The student must supply a current transcript for this evaluation.
2. To obtain transfer of credit, the student must complete the following procedure:
   a. The student will confer with the graduate advisor to ascertain whether the courses to be transferred are a logical part of the student's graduate program;
   b. If the courses are appropriate, the student will deliver to the school that teaches such courses a copy of the current transcript, necessary descriptive materials including catalog descriptions, and textbooks used for evaluation. The faculty of the appropriate school will determine the equivalent Georgia Tech course and the number of credit hours accepted. The faculty member who prepares the transfer credit form should have the school chair cosign it. The school should then send the form directly to the registrar with a copy of the student's Approved Program of Study attached;
   c. If the student wishes to transfer more than the number of hours permitted in item one listed above, a petition must be submitted to the Institute Graduate Curriculum Committee that includes statements of possible justification for the granting of such a petition, transfer credit forms, and the recommendation of the student's school chair.
3. A joint enrollment student may receive graduate credit for up to one-third of the hours required for the degree for graduate courses taken at Emory University or Georgia State University provided that the following is true:
   a. Georgia Tech does not offer such courses;
   b. The student's advisor and school chair approve the courses in advance and in writing;
   c. The student passes the courses with a C or better. Advance approval is satisfied when the courses appear on the student's proposed Program of Study.
4. A student may not receive transfer credit from universities outside the United States and Canada unless the courses were taken at a foreign institution or university that is accredited by a Canadian or U.S. regional accrediting board or has a signed partner agreement with Georgia Tech. In any other case, an international student can obtain credit for courses previously taken but not applied toward another degree by filling out an Examination for Advanced Standing Authorization Request Form, paying the appropriate fee at the Bursar's Office, and passing the examination for advanced standing. The school or college that normally teaches the equivalent course will administer any necessary examinations.

Types of Standing

Applicants holding a bachelor's degree in an appropriate field from a regionally accredited institution will be given full graduate standing upon acceptance and matriculation, provided their previous work is of sufficient quality to indicate immediate success in advanced study.

If the work of an applicant holding an approved bachelor's degree is deficient in content or quality so that supplemental study or demonstrated ability is necessary, the applicant may be given conditional graduate standing upon acceptance.

Applicants who do not wish to qualify for an advanced degree at Georgia Tech, but demonstrate the potential benefits of their participation in advanced study, may gain admission as special non-degree graduate students. Students who are admitted with special non-degree standing for failure to submit official transcripts or for other administrative reasons may apply not more than 16 semester credit hours taken on special non-degree standing toward a degree.

Graduate students in good standing at other U.S. universities may enroll at Georgia Tech as transient graduate students by filing an application for admission and by providing a letter of verification of good standing status from the registrar of the institution at which they are currently enrolled. Work undertaken in transient standing will not apply toward a Georgia Tech degree.

Undergraduate Admissions, not Graduate Studies, will admit students working toward a second bachelor's degree.

In addition to full, conditional, and special non-degree graduate standing, graduate students will be classified by academic standing according to their GPAs: good standing, warning, probation, or drop. (The graduate GPA includes the grades on all courses scheduled by the student after admission to graduate study.) For specific information, see the scholastic regulations.

Undergraduate Admissions

- First-Year
- Transfer
- Readmission

First-Year Admission

General Information for First-Year Admission

First-year students may only apply for the summer or fall terms. A completed application for first-year admission includes a non-refundable application fee and high school transcript (or equivalent). International applicants and applicants who have been homeschooled may be required to submit additional information. We accept the Common Application for first-year admission.

It is the applicant's responsibility to ensure that all required elements, including the application, non-refundable application fee, and high school transcript, are submitted by stipulated deadlines. All elements must be received prior to the first-year application deadlines. More information regarding first-year application deadlines can be found at https://admission.gatech.edu/first-year/deadlines.

Students may self-report standardized test scores on their application for us to use in file review. We will consider self-reported scores listed on your Common Application testing section. We provide a form in your Admission Portal to self-report scores after you submit your application. We will not use scores received via email, fax, or postal service. Students who are admitted and choose to enroll at Tech are required to submit official test scores from the testing agency.

The Office of Undergraduate Admission will consider all completed applications on file by the stated deadlines. For more information regarding first-year admission to the Georgia Institute of Technology, visit www.admission.gatech.edu, call 404.894.4154, or email admission@gatech.edu.

Transfer Admissions

Information regarding how to apply for transfer admission can be found on the Undergraduate Admission website. To be eligible for admission, students must complete the application, submit the non-refundable application fee, and submit official transcripts from all United States colleges or universities ever attended. Students who have completed any coursework outside the United States will be required to submit additional information. All documents must be original and certified as appropriate.

The Office of Undergraduate Admission will consider all completed applications on file by the stated deadlines, provided spaces are available for the particular term or academic year for which the student applies. For more information including admission requirements and deadlines regarding transfer admission to the Georgia Tech, visit https://admission.gatech.edu/transfer/ or call 404.894.4154.

More information:

- Undergraduate Admission | Transfer Admission
- Office of the Registrar | Transfer Credit
- Office of the Registrar | Transfer Equivalency Catalog

Policy on the Competitive Admission of Transfer Applicants

The Georgia Institute of Technology is a top-ranked public university determined to define the technological research university of the 21st century. Publicly funded and governed by the University System of Georgia, the Institute is committed to preparing students for global leadership, effectiveness and innovation.

Consistent with its mission to improve the human condition in Georgia, the United States, and around the globe, Georgia Tech counts the diversity of its students among its greatest strengths and an integral component of its educational process and academic excellence.

The undergraduate admissions process, which reflects the Institute's strategic plan, seeks to identify those applicants, who as individuals and as a group, will benefit from the campus learning environment, and thus enrich the entire student body.

The process is structured to build entering classes of students who will:

- Meet the Institute's requirements for academic success.
- Embrace the diverse campus community.
- Benefit substantially from the Institute's curriculum and scholarly pursuits.
- Develop as leaders, innovators, global citizens and engaged learners.
- Contribute to the intellectual, cultural, social and civic life of the Institute, state, and nation.

How Does Georgia Tech Review Applications?

Each year, Georgia Tech must make fine distinctions among large numbers of highly qualified applicants. The ability to assess consistently all information presented in the application becomes increasingly important.

Therefore, the Office of Undergraduate Admission employs a rigorous review process in order to provide an individualized and holistic evaluation of every application. Each applicant is assessed on the basis of achievements and potential in a broad range of categories, viewed in the context of the opportunities and challenges the applicant faced.

These categories include:

- Strength of educational performance and potential for academic success, as measured by the nature and rigor of curriculum and academic achievements.
- Potential to contribute to the overall intellectual climate and make a positive contribution to campus and community life.
- Demonstrated commitment to intellectual engagement.
- Competitiveness within academic major.

Appeals concerning individual admission decisions shall be addressed to the Executive Director of the Office of Undergraduate Admission or the Vice Provost for Enrollment Management.

Academic Advising

The appointed academic advisor is the key source of information about the college. All entering students are assigned an academic advisor depending on their declared majors at Georgia Tech. To find the assigned advisor, visit the advising Web page. Students will meet their assigned advisors at orientation and at regular intervals during their college careers. Advisors welcome questions about different programs and areas.

Academic advisors are the guides through the college experience. They will help to identify the correct major, curriculum, minor, certificates, study abroad, internships, campus resources, and much more.

While the degree requirements are posted on the Registrar's Office web page, it is essential to check in with the assigned advisor at least once a year (if not more) to ensure that requirements are being met and communication lines are open. Also, regular contact with the advisor will

enhance each student's college experience and help them reach their future goals.

Academic Advising

Degree Requirements

Required Computer Ownership

In an effort to foster equal access to computers and to make the most of the teaching and learning technology available at Georgia Tech, all undergraduate students entering Georgia Tech under this or subsequent catalogs are required to own or lease a computer. The minimum hardware and software requirements (as well as purchasing and financing options) are sent each spring to students accepted for the summer and fall semesters, and in the fall to students accepted for spring semester.

Because computer ownership is mandatory, an average cost for the minimum hardware and software required can be included in computing a new student's cost of education for the purpose of determining their eligibility for all forms of student financial aid. Students should contact the Office of Scholarships and Financial Aid for more information.

Student Computer Ownership Website

International Students

International students should access further information regarding application policies and procedures and other basic information helpful to applicants from other countries by visiting https://admission.gatech.edu/international/first-year. International students will not receive financial aid or institutional scholarships.

For more information, email the Office of Undergraduate Admission at admission@gatech.edu.

Office of International Education

Office of Undergraduate Admission

FASET (New Student Orientation)

Familiarization and Adaptation to the Surroundings and Environs of Tech (FASET) is coordinated by The Office of New Student and Transition Programs.

FASET is Georgia Tech's orientation program for incoming undergraduate students and their families.

- First-year students
- New transfer students
- New exchange students
- Parents, family members, and guests of these students

FASET has been a Georgia Tech tradition since 1972. Orientation sessions are offered at the start of each semester for transfer and exchange students and during the summer for incoming first-year students.

During FASET, new students receive academic advisement, register for their first semester of courses, and complete other business items. In addition, Georgia Tech faculty, staff, and administrators discuss important campus services, student organizations, the undergraduate curriculum, and academic programs. Most importantly, students, parents, and guests have the opportunity to meet and interact with current Georgia Tech students and to get to know other new students, parents, and guests.

For more information, call 404.894.6897 or visit www.transitionprograms.gatech.edu.

Regents' Testing Program

Effective Spring 2010

The Regents' exam is no longer required at Georgia Tech as a result of a recent decision by The Board of Regents'.

Sophomore Programs

In collaboration with campus departments and academic units, the Office of New Student and Sophomore Programs provides programs and services to support sophomore success and meet the unique needs of students during this critical academic transition. The overall goals of these programs are to help sophomores in managing and succeeding with sophomore year courses, moving from exploration to decision-making about majors and careers, developing meaningful relationships on-campus and beyond, pursuing involvement and leadership opportunities, and creating a sophomore class identity. These goals are achieved through multiple programs, including:

- Sophomore Leadership Council
- Sophomore Leadership Forum
- Year 2 at Tech E-Newsletter
- Sophomore Career Experience

More information is available from the Office of New Student and Sophomore Programs.

Transfer Credit

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Students may attend another institution as a transient student during terms when not enrolled at Georgia Tech. Students should discuss their course selection with their academic advisor to ensure transferability and applicability toward their degree programs. With the exception of officially sanctioned cross-enrolled programs, students are not to be enrolled at Georgia Tech and another institution during the same term without the specific approval the Institute Undergraduate Curriculum Committee or Institute Graduate Curriculum Committee, as appropriate.

Transfer Credit Policy

Policy on Transfer Credit

1. Only official transcripts from other schools may be used to evaluate and/or award credit.
   - **New students** must request that an official transcript from all previously attended colleges and universities be mailed to the Admissions Office.
   - Georgia Institute of Technology
     Undergraduate Admissions Office
     Atlanta, GA 30332-0320
   - **Current or previously enrolled Georgia Tech students** must have an official transcript from all other colleges and universities mailed to:
   - Georgia Institute of Technology
     Office of the Registrar
     Transfer Credit
     Atlanta, GA 30332-0320
2. The basic policy regarding the acceptance of the courses by transfer is to allow credit for courses completed with satisfactory grades (C or better) in other accredited colleges provided the courses correspond in time and content to courses offered at the Georgia Institute of Technology. Georgia Tech assumes responsibility for the academic quality of any work or credit recorded on the institution's transcript. Transfer credits will be accepted from newly-formed institutions of the University System of Georgia prior to accreditation.
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1. Check the online equivalency database for updates. New evaluations are posted daily.
2. Notify the Office of the Registrar's Transfer Credit Department of any not-awarded credit. Send an email to comments@registrar.gatech.edu
3. Using the Transfer Credit web site, submit courses for evaluation.

About Transfer Credit

1. Georgia Tech does not offer correspondence courses and does not grant credit for correspondence courses taken at other institutions. Academic units reserve the right to take such things as delivery method into consideration. For example, on-line courses and computer-instructed courses may not be accepted by some academic units for credit.
2. Georgia Tech does not grant credit for the College Level General Educational Development Tests, CLEP, USAFI courses, or courses completed at any United States armed services, with the exception of the military academies and schools with full accreditation.
3. Georgia Tech does not grant credit for professional certificate programs.
4. The following items are among other circumstances in which non-resident credit is not granted:
   - Courses previously completed at Georgia Tech.
   - College courses taken to meet freshman admissions requirements.
   - Remedial courses.
   - Courses basically secondary school or pre-college level.
   - Courses with essentially non-academic content.
   - Vocational courses.
   - Learning support courses.
5. Non-resident credit is not computed as a part of the student's grade point average at Georgia Tech.

Advanced Placement (AP) and International Baccalaureate (IB)

For Advanced Placement (AP), visit the Advanced Placement page for more information.

For International Baccalaureate (IB), visit the International Baccalaureate page for more information.

Note: Once enrolled at Georgia Tech, students are not allowed to take College Board (Advanced Placement and SAT II), International Baccalaureate or A-Level Examinations for credit. All examinations must be completed prior the student's enrollment date. Students who offer satisfactory evidence that they are qualified to do so may receive credit for a course by examination at Georgia Tech. Such an examination is called an "Examination for Advanced Standing."

More information:

Transfer Equivalency Catalog

Readmission

Any student who is not enrolled for three or more consecutive terms (counting Summer Session) must apply for readmission. The Application for Readmission, with all pertinent supporting information, must be submitted to the Office of the Registrar before the deadline for the term for which readmission is requested as listed below:

Term Deadline [1]

Term	Date
Fall	July 1st
Spring	December 1st
Summer	April 1st

[1] Former students on drop or review status should apply at least two months prior to these deadlines in order to ensure sufficient time for the review process.

The "Rules and Regulations" section in this Catalog contains additional information on readmission.

Students who withdraw from the Institute (receiving all grades of "W") will not ordinarily be permitted to enroll the next succeeding term. If an exception is requested due to unusual circumstances, a Petition to the Faculty must be filed.

Students who have been out three or more terms will be required to meet health, lawful presence, and other certification requirements in effect at the time of readmission.

More information:

- Withdrawal / Readmission Policies
- Medical Regulations
- Lawful Presence Requirement
- Office of the Registrar | Readmission Policy

Academic Advising

The appointed academic advisor is the key source of information about the college. All entering students are assigned an academic advisor depending on their declared majors at Georgia Tech. To find the assigned advisor, visit the advising Web page. Students will meet their assigned advisors at orientation and at regular intervals during their college careers. Advisors welcome questions about different programs and areas.

Academic advisors are the guides through the college experience. They will help to identify the correct major, curriculum, minor, certificates, study abroad, internships, campus resources, and much more.

While the degree requirements are posted on the Registrar's Office web page, it is essential to check in with the assigned advisor at least once a year (if not more) to ensure that requirements are being met and communication lines are open. Also, regular contact with the advisor will enhance each student's college experience and help them reach their future goals.

Academic Advising

Degree Requirements

Readmission Immunization Requirements

Any student who is not enrolled for two or more consecutive terms (counting Summer Session) must apply for readmission. Students seeking readmission be required to meet health, lawful presence, and other certification requirements in effect at the time of readmission.

More information:

- Withdrawal / Readmission Policies
- Medical Regulations
- Lawful Presence Requirement

Regents' Testing Program

Effective Spring 2010

The Regents' exam is no longer required at Georgia Tech as a result of a recent decision by The Board of Regents'.

Transfer Credit

The basic policy regarding the acceptance of courses by transfer is to allow credit for courses completed with satisfactory grades ("C" or better) at other accredited colleges and universities in the United States and Canada, provided the courses correspond in time and content to courses offered at Georgia Tech. The Institute will not accept credit for courses successfully completed at another institution but previously taken at Georgia Tech unless the final grade received at Georgia Tech is a "W." The student must request and file an official transcript of transfer courses before the Institute can award credit. Coursework completed at colleges and universities outside the United States and Canada will be evaluated on a case-by-case basis. Transfer credit is not calculated in the Georgia Tech grade-point average.

Students may attend another institution as a transient student during terms when not enrolled at Georgia Tech. Students should discuss their course selection with their academic advisor to ensure transferability and applicability toward their degree programs. With the exception of officially sanctioned cross-enrolled programs, students are not to be enrolled at Georgia Tech and another institution during the same term without the specific approval the Institute Undergraduate Curriculum Committee or Institute Graduate Curriculum Committee, as appropriate.

Transfer Credit Policy

Policy on Transfer Credit

1. Only official transcripts from other schools may be used to evaluate and/or award credit.
   - **New students** must request that an official transcript from all previously attended colleges and universities be mailed to the Admissions Office.
   - Georgia Institute of Technology
     Undergraduate Admissions Office
     Atlanta, GA 30332-0320

   - **Current or previously enrolled Georgia Tech students** must have an official transcript from all other colleges and universities mailed to:
   - Georgia Institute of Technology
     Office of the Registrar
     Transfer Credit
     Atlanta, GA 30332-0320

2. The basic policy regarding the acceptance of the courses by transfer is to allow credit for courses completed with satisfactory grades (C or better) in other accredited colleges provided the courses correspond in time and content to courses offered at the Georgia Institute of Technology. Georgia Tech assumes responsibility for the academic quality of any work or credit recorded on the institution's transcript. Transfer credits will be accepted from newly-formed institutions of the University System of Georgia prior to accreditation.
3. Georgia Tech will not award credit for courses successfully completed at another institution which were previously taken at Georgia Tech.
4. A petition to the faculty must be approved to use course work more than ten years old.
5. Georgia Tech reserves the right to test the proficiency of any student in course work transferred from other institutions and to disallow credit in courses in which the student cannot demonstrate acceptable proficiency.

Transfer Credit for Online Courses

Georgia Tech accepts credit for coursework as listed on the transfer equivalency table online at oscar.gatech.edu.

Requesting Transfer Credit for Courses Not Previously Evaluated

1. Check the online equivalency database for updates. New evaluations are posted daily.
2. Notify the Office of the Registrar's Transfer Credit Department of any not-awarded credit. Send an email to comments@registrar.gatech.edu
3. Using the Transfer Credit web site, submit courses for evaluation.

About Transfer Credit

1. Georgia Tech does not offer correspondence courses and does not grant credit for correspondence courses taken at other institutions. Academic units reserve the right to take such things as delivery method into consideration. For example, on-line courses and computer-instructed courses may not be accepted by some academic units for credit.
2. Georgia Tech does not grant credit for the College Level General Educational Development Tests, CLEP, USAFI courses, or courses completed at any United States armed services, with the exception of the military academies and schools with full accreditation.
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4. The following items are among other circumstances in which non-resident credit is not granted:
   - Courses previously completed at Georgia Tech.
   - College courses taken to meet freshman admissions requirements.
   - Remedial courses.
   - Courses basically secondary school or pre-college level.
   - Courses with essentially non-academic content.
   - Vocational courses.
   - Learning support courses.
5. Non-resident credit is not computed as a part of the student's grade point average at Georgia Tech.

Advanced Placement (AP) and International Baccalaureate (IB)

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For International Baccalaureate (IB), visit the International Baccalaureate page for more information.

Note: Once enrolled at Georgia Tech, students are not allowed to take College Board (Advanced Placement and SAT II), International Baccalaureate or A-Level Examinations for credit. All examinations must be completed prior the student's enrollment date. Students who offer satisfactory evidence that they are qualified to do so may receive credit for a course by examination at Georgia Tech. Such an examination is called an "Examination for Advanced Standing."

More information:

Transfer Equivalency Catalog

FINANCIAL

- Assistance
- Billing
- Cancellation of Registration
- Fees
- Payment
- Refunds
- Student Financial Agreement
- Tuition
- VA Compliance Statement
- Verification of Participation

Assistance

- Graduate Financial Assistance
- Undergraduate Financial Assistance

Graduate Financial Assistance

The Institute offers financial aid from a variety of sources to assist students with the pursuit and completion of their degrees as rapidly as circumstances permit.

Students should address inquiries for financial assistance to the graduate coordinator of the school in which they plan to study. Graduate school applicants should also investigate national fellowships offered by various foundations, professional organizations, and government agencies; many are listed with the Fellowships Office. Educational loans are available for qualified applicants through the Office of Scholarships and Financial Aid. More information about Federal Loan programs and various alternative loan programs may be found at www.finaid.gatech.edu.

- Assistantships
- Fellowships
- Out-of-State Tuition Waivers
- Outside Sponsorships
- Veterans Services
- 62 and Older Student Waiver

Assistantships

Graduate Research Assistantships

Students receiving Graduate Research Assistantships must be registered for at least twelve total graduate credits with at least nine hours attempted for a letter grade or on a Pass/Fail basis and be employed at least one-third of the time by the Institute. Students receiving Graduate Research Assistantships are also eligible for a tuition waiver.

Graduate Teaching Assistantships

Students receiving Graduate Teaching Assistantships must be registered for at least twelve total graduate credits with at least nine hours attempted for a letter grade or on a Pass/Fail basis and be employed at least one-third of the time by the Institute. Students receiving Graduate Teaching Assistantships are also eligible for a tuition waiver.

Graduate Assistantship Schedule and Flexibility Policy

Source: Georgia Tech Policy Library

Policy Statement: The work duties of Graduate Research Assistants (GRAs) and Graduate Teaching Assistants (GTAs, encompass 4.5 calendar months for fall and spring terms and three calendar months for summer term. The fall term work period consists of half of August and all of September through December. The spring term work period consists of January through April and half of May. Summer term consists of half of May, all of June and July, and half of August. Supervisors are generally expected to employ a GRA or GTA for the full work period, providing continuous employment and pay throughout the year.

GRAs and GTAs are not required to work on official Institute holidays, which appear on the Human Resources web site. In addition, at the discretion of the student's supervisor, a GRA or GTA may be permitted to average effort over several weeks or cluster research or teaching activities in order to spend one or more weeks away from campus during the semester or, more frequently, during periods when classes are not in session. Any time away requires the approval of the supervisor. This flexibility may be used to allow later start dates for students new to campus. Some work assignments may not permit this flexibility.

GRAs or GTAs appointed to sponsored research projects should monitor their appointments monthly in the Electronic Workload Assignment Form (EWAF), because they will be required to sign an Annual Statement of Reasonableness indicating that the effort they put into projects was correctly recorded. For more information, read the policy on Personal Services Reporting Using the Plan Confirmation System in the Georgia Tech Policy Library.

Fee Payment through Payroll Deduction

The Office of the Bursar maintains information regarding the GRA/GTA-Fee Payment Program which facilitates the payment of tuition and fees through payroll deductions for students who are employed at Georgia Tech as Graduate Research Assistants (GRAs) or Graduate Teaching Assistants (GTAs) and who are paid on a monthly basis. For more information, read the policy on Payroll Deduction for Tuition and Fees on the Office of the Bursar's web site.

Fellowships

A large number of individual fellowships are awarded to Georgia Tech students. They vary in value from a few hundred dollars to $30,000 or more per year. Most of them are awarded internally by schools, not by the Office of Graduate Education or the Office of Scholarships and Financial Aid. Even for campus awards for which students from several disciplines are eligible, nominations usually come from within the programs, rather than directly from students.

The only Institute-level fellowship programs are President's Fellowships ($5,500 per year) and Georgia Tech Institute Fellowships ($7,500 per year). These supplement assistantships or other fellowships. Schools nominate incoming students for these programs, and the Office of Graduate Education works with the Office of Scholarships and Financial Aid to administer the awards. Click here for more details about other available fellowships.

Graduate Financial Aid

Out-of-State Tuition Waivers

Georgia Tech has permission from the Board of Regents to award out-of-state tuition differential waivers and assess in-state tuition for certain nonresidents of Georgia for the following reasons and under the following conditions. The waivers processed in the Office of the Registrar are listed below. Any student requesting to pay at the in-state tuition rate will be required to provide verification of their lawful presence in the United States in order to be classified as an in-state student or awarded an out-of-state tuition waiver. See Lawful Presence.

- **University System Employees and Dependents**
  Full-time employees of the University System, their spouses, and their dependent children.
  Download Application for USG Employess and Dependents

- **Full-time School Employees**
  Full-time employees in the public schools of Georgia or the Technical College System of Georgia, their spouses, and their dependent children. Teachers employed full-time on military bases in Georgia shall also qualify for this waiver (BR Minutes, 1988-89, p.43).
  Download Application for Full-Time School Employees

- **Career Consular Officials**
  Career consular officers, their spouses, and their dependent children who are citizens of the foreign nation that their Consulate office represents and who are stationed and living in Georgia under orders of their respective governments.
  Download Application for Career Consular Officials

- **Military**
  a. Active duty military personnel, their spouses, and their dependent children who meet one of the following:
     i. The military sponsor is currently stationed in or assigned to Georgia; or,
     ii. The military sponsor previously stationed in or assigned to Georgia is reassigned outside of Georgia, and the student(s) remain (s) continuously enrolled in a Georgia school, Technical College System of Georgia institution, and/or a University System of Georgia institution; or,
     iii. The military sponsor is reassigned outside of Georgia and the spouse and/or dependent children remain in Georgia; or,
     iv. The military sponsor is stationed in a state contiguous to the Georgia border and resides in Georgia; or,
     v. Dependent children of a military sponsor, previously stationed in or assigned to Georgia within the previous five years, or the child completed at least one year of high school in Georgia; or,
     vi. Any student utilizing VA educational benefits transferred from a currently serving military member is also eligible, even if the student is no longer a dependent of the transferor.
        - Download Application for Active Duty Military Personnel

  b. Active members of the Georgia National Guard stationed or assigned to Georgia or active members of a unit of the U.S. Military Reserves based in Georgia, and their spouses and their dependent children (BoR Minutes, October 2008).
     - Download Application for GA National Guard and Reservists

  c. Separated military members from a uniformed military service of the United States who meet one of the following (BoR Minutes, June 2004; October 2008; October 2013: March 2016; May 2017):
     i. Individuals who within thirty-six (36) months of separation from such service, enroll in an academic program and demonstrate intent to become domiciled in Georgia. This waiver may also be granted to their spouses and dependent children.
     ii. Any separated service member or any student utilizing transferred VA educational benefits, and physically residing in the state.
     iii. Any individual as described in 38 U.S.C. 3679(c).
     iv. Anyone using benefits under the Marine Gunnery Sergeant John David Fry Scholarship who lives in the state in which the institution is located (regardless of formal state residence).< >Except...Surviving spouses can use the Fry Scholarship for 15 years from the anniversary of the service member's death or until they remarry.{C}Eligible children can use the Fry Scholarship between the ages of 18 and 33.{C}Download Application for Those Separated from the Military

- **Economic Advantage**
  As of the first day of classes for the term, an economic advantage waiver may be granted to a U.S. citizen or U.S. legal permanent resident who is a dependent or independent student and can provide clear evidence that the student or the student's parent, spouse, or U.S. court-appointed legal guardian has relocated to the State of Georgia to accept full-time, self-sustaining employment and has established domicile in the State of Georgia. Relocation to the state must be for reasons other than enrolling in an institution of higher education. For U.S. citizens or U.S. legal permanent residents, this waiver will expire 12 months from the date the waiver was granted.
  As of the first day of classes for the term, an economic advantage waiver may be granted to an independent non-citizen possessing a valid employment-related visa status who can provide clear evidence of having relocated to the State of Georgia to accept full-time, self-sustaining employment. Relocation to the state must be for employment reasons and not for the purpose of enrolling in an institution of higher education. These individuals must be able to show clear evidence of having taken legally permissible steps toward establishing legal permanent residence in the United States and the establishment of legal domicile in the State of Georgia. Independent non-citizen students may continue to receive this waiver as long as they maintain a valid employment-related visa status and can demonstrate continued efforts to establish U.S. legal permanent residence and legal domicile in the State of Georgia.
  A dependent non-citizen student who can provide clear evidence that the student's parent, spouse, or U.S. court-appointed legal guardian possesses a valid employment-related visa status and can provide clear evidence of having relocated to the State of Georgia to accept full-time, self-sustaining employment is also eligible to receive this waiver. Relocation to the state must be for employment reasons and not for the purpose of enrolling in an institution of higher education. These individuals must be able to show clear evidence of having taken legally permissible steps toward establishing legal permanent residence in the United States and the establishment of legal domicile in the State of Georgia. Non-citizen students currently receiving a waiver who are dependents of a parent, spouse, or U.S. court-appointed legal guardian possessing a valid employment-related visa status may continue to receive this waiver as long as they can demonstrate that their parent, spouse, or U.S. court-appointed legal guardian is maintaining full-time, self-sustaining employment in Georgia and is continuing efforts to pursue an adjustment of status to U.S. legal permanent resident and the establishment of legal domicile in the State of Georgia. (BR Minutes, October 2008.)

Download Application for Economic Advantage

- **Non-Resident Students**
  As of the first day of classes for the term, a non-resident student can be considered for this waiver under the following conditions:
  - Students under 24.
    - If the parent, or United States court-appointed legal guardian has maintained domicile in Georgia for at least twelve (12) consecutive months and the student can provide clear and legal evidence showing the relationship to the parent or United States court-appointed legal guardian has existed for at least twelve (12) consecutive months immediately preceding the first day of classes for the term. Under Georgia code, legal guardianship must be established prior to the student's 18th birthday (BoR Minutes, October 2008, title amended February 2010); or
    - If the student can provide clear and legal evidence showing a familial relationship to the spouse and the spouse has maintained domicile in Georgia for at least twelve (12) consecutive months immediately preceding the first day of classes for the term (BoR Minutes, February 2010).
  - Students 24 and Older.
    - If the student can provide clear and legal evidence showing a familial relationship to the spouse and the spouse has maintained domicile in Georgia for at least twelve (12) consecutive months immediately preceding the first day of classes for the term. This waiver can remain in effect as long as the student remains continuously enrolled (BoR Minutes, October 2008, title amended February 2010).

This waiver can remain in effect as long as the student remains continuously enrolled (BoR Minutes, October 2008).

Download Application for Non-Resident Students

- **Senior Citizen Waiver**
  A s of the first day of classes for the term, a waiver of in-state tuition and fees may be granted to a legal resident of Georgia aged 62 and over. This waiver can remain in effect as long as the student is continuously enrolled.
  Download Application for Senior Citizens

Students who come to Georgia Tech from another state and work for companies in Georgia remain ineligible for in-state tuition in the absence of compelling evidence of intent to remain in Georgia permanently. Having Georgia voter registration, having employment in any position normally filled by a student (such as co-op, graduate research assistant, or graduate teaching assistant), having a lease of living quarters, having a Georgia automobile registration, and having Georgia driver's license do not constitute sufficient evidence of domicile to affect classification as an in-state student under the Board of Regents' policy.

For further information concerning residency, students should contact the Residency Office in Room 112 of TechTower, write to the Office of the Registrar, Residency, Georgia Tech, Atlanta, GA 30332-0315, or email comments@registrar.gatech.edu. The Residency Office must receive an application for classification as a legal resident for fee payment purposes no later than one month prior to the academic registration date for the term in which the student seeks to pay fees as a resident of Georgia. Requests for tuition waivers must be received by the Office of the Registrar no later than the first day of classes for the term for which the out-of-state tuition is to be waived. See the official Academic Calendar for dates.

Outside Sponsorships

A student whose tuition and fees are to be paid by a corporate or government sponsor must notify the Bursar's Office by submitting an authorization or voucher from the sponsor on original letterhead and signed by an official authorized to obligate payment by the organization per the specifics outlined here. Authorizations must be received before the payment deadline each semester. Payment deadlines for upcoming terms are published on the Bursar's Calendar. As a courtesy to students, the Bursar's Office sends a billing statement to the sponsor after the Registration Period ends. A student whose sponsor fails to pay the authorized charges will have their conditional credit reversed and will be responsible for the unpaid charges. A financial hold will be placed on the student's account until the balance is paid in full. Students are encouraged to remain in contact with their sponsor until all terms of a billing authorization are met.

Important links:

- Bursar's Office | Third-Party Blling
- Bursar's Office | Bursar's Calendar

Veterans Services

Veterans Services at Georgia Tech is not a division of the US Department of Veterans Affairs (DVA) but part of the Office of the Registrar. It serves as a liaison between veteran students and the DVA. Its primary purposes are to assist veteran students with the processing of forms for educational benefits, to advise veteran students about certain procedural requirements, and to certify enrollment of Georgia Tech veteran students to the Department of Veterans Affairs.

Because the US Department of Veterans Affairs (DVA) must receive certification of enrollment before issuing benefit payments, any student planning to enroll under any of the DVA's programs should initiate the certification procedure through the Office of the Registrar as early as possible.

Veterans must apply to Georgia Tech through the regular admissions procedure. Eligibility for DVA benefits does not guarantee acceptance into the Institute, nor does acceptance signify eligibility for DVA benefits. The Institute serves only as a source of certification and information to the DVA; the student must carry out all financial transactions with the US Department of Veterans Affairs directly.

- Contact Information
- DoD Tuition Assistance
- Starting Benefits
- Types of Benefits
- Certification Process
- Frequently Used Forms
- Additional Information

Contact Information

GT School Certifying Official (SCO):
veterans@registrar.gatech.edu
phone: 404.894.4953
fax: 404.894.0167

GT Veterans Resource Center:
311 Ferst Dr.
Atlanta, GA 30318
phone: 404.385.2067

Department of Veterans Affairs
Atlanta Regional Office
P.O. Box 100026
Decatur, GA 30031-7026
atlrpo@vba.va.gov

US Department of Veterans Affairs:
Online Queries
www.gibill.va.gov
1.888.GIBILL.1
1.888.422.4551

Starting Benefits

Before a student can use GI Bill® education benefits, she/he must be formally admitted to Georgia Tech. Prospective students who need information about applying should see the Undergraduate Admissions web site. Individuals who intend to utilize GI Bill® education benefits are admitted by the same standards as any other students.

Those who intend to utilize GI Bill® education benefits for the first time should apply for these benefits least two months before the start of the first academic term in which they will be enrolled as students at Georgia Tech.

First-Time GI Bill® Applicants

If the student has already applied for GI Bill® Education Benefits

- After a student applies for education benefits, the US Department of Veterans Affairs (DVA) sends a Certificate of Eligibility (COE) letter indicating the type of benefit awarded and the terms of eligibility under that benefit. A copy of this letter must be submitted to Ansley Sharp, the School Certifying Official (SCO) at Georgia Tech, via fax at 404.894.0167 or e-mail at veterans@registrar.gatech.edu.

If the student need to apply for GI Bill® Education Benefits

- If the student is the veteran
  - Veterans enrolling at Georgia Tech must apply for benefits through the GI Bill® web site.
  - After a student applies for education benefits, the US Department of Veterans Affairs (DVA) sends a Certificate of Eligibility (COE) letter indicating the type of benefit awarded and the terms of eligibility under that benefit. A copy of this letter must be submitted to Ansley Sharp, the School Certifying Official (SCO) at Georgia Tech, via fax at 404.894.0167 or e-mail at veterans@registrar.gatech.edu.
- If the student is the dependent or spouse of the veteran
  - A veteran may transfer Ch 33 Post 9/11 GI Bill® benefits to a family member with the approval of the US Department of Defence (DoD). Information regarding transfer of benefits is available on the GI Bill® web site. Once the DoD approves transfer of benefits, the family member must submit Form 22-1990e, "Application for Family Member to Use Transferred Benefits," online or by mailing the printable form to the address below:
    Department of Veterans Affairs
    VA Regional Office
    P.O. Box 8888
    Muskogee, OK 74402-8888
  - After family member applies for education benefits, the Department of Veterans Affairs (DVA) sends a Certificate of Eligibility (COE) letter indicating the type of benefit awarded and the terms of eligibility under that benefit. A copy of this letter must be submitted to Ansley Sharp, the School Certifying Official (SCO) at Georgia Tech, via fax at 404.894.0167 or e-mail at veterans@registrar.gatech.edu.

Transferring GI Bill® Education Benefits to Georgia Tech

- A student who has used GI Bill® Education Benefits at another college or university must complete Form 22-1995, "Request for Change of Program or Place of Training." This form may be submitted online or by mailing the printable form to the address below:
  Department of Veterans Affairs
  VA Regional Office
  P.O. Box 8888
  Muskogee, OK 74402-8888

Signing Up for Yellow Ribbon

- A formally admitted student who is eligible and who has already sent a copy of her/his Certificate of Eligibility (COE) letter to the School Certifying Official (SCO) may be added to either the Yellow Ribbon participant list or the waiting list. Yellow Ribbon is given on a first-come, first-served basis. If all 40 participant slots are taken when a student completes the Yellow Ribbon Participation Request Form, the student will be placed on a waiting list until a slot becomes available.
- The Yellow Ribbon Participation Request Form is submitted only once. After student is given a participant slot for the Yellow Ribbon program, she/he is eligible to receive this benefit until she/he exhausts her/his Ch 33 benefits, graduates, or stops attending Georgia Tech (e.g., loses registration eligibility by absence or failure to participate in scheduled classes).

Types of Benefits

The Department of Veterans Affairs (DVA) administers a variety of education benefit programs. Many veterans and active duty personnel can qualify for education benefits. Currently, Georgia Tech participates in the following programs:

- Chapter 33, The Post-9/11 GI Bill® (Yellow Ribbon)
- Chapter 30, Montgomery GI Bill® - Active Duty (MGIB-AD)
- Chapter 35, Survivors' and Dependents' Educational Assistance Program (DEA)
- 1606 - Montgomery GI Bill® - Selected Reserve (MGIB-SR)
- Chapter 31, Veteran Readiness and Employment (VR&E)

Certification Process

The School Certifying Official (SCO) releases an email to notify veteran students that initial enrollment certifications will be submitted 45 days before the start of the academic term. At this time, students may ask any questions or request to not be certified. Submitting the initial enrollment certification 45 days prior to the start of the semester ensures that students' first monthly stipend will be issued on time.

For students under Chapter 33 Post-9/11 GI Bill® (Yellow Ribbon), this is the first of two certifications. The first certification reports a student's enrollment for her/his monthly stipend. The second certification reports

tuition and mandatory student fees (and Yellow Ribbon funding if applicable) after the Phase 2 Registration Period ends.

The Office of the Bursar places a deferral on each Chapter 33 student's account for the amount expected from the DVA. This deferral prevents the assessment of late fees or schedule cancellation due to the student's account balance. Students should make plans to pay whatever balance is not covered by Chapter 33 (e.g., housing, parking, meal plan) before the regular payment deadlines.

Students' Responsibilities

Veteran students at Georgia Tech have ongoing responsibilities to the Department of Veterans Affairs. The DVA and the Veterans Services office at Georgia Tech closely monitor each veteran student's enrollment status and academic program. The student's entitlement is based upon the number of credit hours for which a student is enrolled and any changes in academic program. To ensure that a student's enrollment is certified to the DVA accurately, the student must abide by the following requirements:

- Check the Georgia Tech Veterans Services web page for current news
- Read all notification emails from the School Certifying Official (SCO)
- Email the SCO if adjustments are made to class schedule during the Phase 2 Registration Period
- Email the SCO if adjustments need to be made to schedule after the Phase 2 Registration Period ends
- Email the SCO if changing address or academic major

Frequently Used Forms

Below are the most frequently used printable forms. All other printable forms may be found in the Forms Library the DVA web site.

- Printable forms should be mailed to the DVA regional office in Atlanta.
  Department of Veterans Affairs
  VA Regional Office
  P.O. Box 8888
  Muskogee, OK 74402-8888

- Form 22-1990, Application for VA Education Benefits
- Form 22-1990e, Application for Family Member to Use Transferred Benefits
- Form 22-1995, Request for Change of Program or Place of Training
- Form 22-5495, Dependents' Request for Change of Program or Place of Training
- VA Course Withdrawal Form
- Tuition Assistance Withdrawal Form
- Yellow Ribbon Participation Request Form
- Mandatory Student Fee Waiver Form for Active Duty Military and Veterans

Additional Information

More information is available on the Office of the Registrar's web site on the Veterans Services' Frequently Asked Questions (FAQ) page.

GI Bill® is a registered trademark of the U.S. Department of Veterans Affairs (VA). More information about education benefits offered by VA is available at the official U.S. government Web site at https://www.benefits.va.gov/gibill.

DoD Tuition Assistance (TA)

The Tuition Assistance (TA) program pays the cost of tuition and some additional fees. Nearly all active duty military service members are eligible for TA. However, each service branch determines eligibility criteria that often reduce access. Tuition Assistance covers up to 100% Tuition and Fees, not to exceed $250.00 per semester credit hour or $4500.00 per fiscal year.

All service members should speak with their Educational Services Officer (ESO) or counselor within their military service prior to enrolling at Georgia Tech or any institution. Since military funding is limited, it is important for all service members to use all their resources in making any educational decision.

62 and Older Student Waiver

Georgia residents who are aged 62 and older may be eligible to take courses on a space available basis at little or no cost.As of the first day of classes for the term, a waiver of in-state tuition and fees may be granted to a legal resident of Georgia aged 62 and over. This waiver can remain in effect as long as the student is continuously enrolled.

For more information, please visit: https://registrar.gatech.edu/prospective-students/62-or-older

Undergraduate Financial Assistance

The Office of Scholarships and Financial Aid (OSFA) is dedicated to helping current and prospective students and parents apply for financial aid and understand the options for meeting the cost of a college education at Georgia Tech. The OSFA awards federal, state, and Institute funds to students and directs students to other sources of aid. Additionally, the OSFA serves as the disbursement and delivery agent for all sources of assistance for students, including awards for Georgia Tech students from outside agencies.

All US Citizen and Permanent Resident undergraduate students, including transfer students, who are interested in scholarships, grants, loans, and/or work opportunities must submit the "Georgia Tech Application for Scholarships and Financial Aid" and the "Free Application for Federal Student Aid" (FAFSA). The priority application deadline for entering freshman students, returning undergraduate students, and transfer students is January 31st.

Additional information is available for the Office of Scholarships and Financial Aid.

Office of Scholarships and Financial Aid
Georgia Institute of Technology
Atlanta, Georgia 30332-0460.

- Out-of-State Tuition Waivers
- Outside Sponsorships
- President's Scholarship Program
- Veterans Services
- 62 and Older Student Waiver
- DoD Tuition Assistance

Out-of-State Tuition Waivers

Georgia Tech has permission from the Board of Regents to award out-of-state tuition differential waivers and assess in-state tuition for certain nonresidents of Georgia for the following reasons and under the following conditions. The waivers processed in the Office of the Registrar are listed below. Any student requesting to pay at the in-state tuition rate will be required to provide verification of their lawful presence in the United States in order to be classified as an in-state student or awarded an out-of-state tuition waiver. See Lawful Presence.

- **University System Employees and Dependents**
  Full-time employees of the University System, their spouses, and their dependent children.
  Download Application for USG Employess and Dependents

- **Full-time School Employees**
  Full-time employees in the public schools of Georgia or the Technical College System of Georgia, their spouses, and their dependent children. Teachers employed full-time on military bases in Georgia shall also qualify for this waiver (BR Minutes, 1988-89, p.43).
  Download Application for Full-Time School Employees

- **Career Consular Officials**
  Career consular officers, their spouses, and their dependent children who are citizens of the foreign nation that their Consulate office represents and who are stationed and living in Georgia under orders of their respective governments.
  Download Application for Career Consular Officials

- **Military**
  a. Active duty military personnel, their spouses, and their dependent children who meet one of the following:
     i. The military sponsor is currently stationed in or assigned to Georgia; or,
     ii. The military sponsor previously stationed in or assigned to Georgia is reassigned outside of Georgia, and the student(s) remain (s) continuously enrolled in a Georgia school, Technical College System of Georgia institution, and/or a University System of Georgia institution; or,
     iii. The military sponsor is reassigned outside of Georgia and the spouse and/or dependent children remain in Georgia; or,
     iv. The military sponsor is stationed in a state contiguous to the Georgia border and resides in Georgia; or,
     v. Dependent children of a military sponsor, previously stationed in or assigned to Georgia within the previous five years, or the child completed at least one year of high school in Georgia; or,
     vi. Any student utilizing VA educational benefits transferred from a currently serving military member is also eligible, even if the student is no longer a dependent of the transferor.
        - Download Application for Active Duty Military Personnel

  b. Active members of the Georgia National Guard stationed or assigned to Georgia or active members of a unit of the U.S. Military Reserves based in Georgia, and their spouses and their dependent children (BoR Minutes, October 2008).
     - Download Application for GA National Guard and Reservists

  c. Separated military members from a uniformed military service of the United States who meet one of the following (BoR Minutes, June 2004; October 2008; October 2013: March 2016; May 2017):
     i. Individuals who within thirty-six (36) months of separation from such service, enroll in an academic program and demonstrate intent to become domiciled in Georgia. This waiver may also be granted to their spouses and dependent children.
     ii. Any separated service member or any student utilizing transferred VA educational benefits, and physically residing in the state.
     iii. Any individual as described in 38 U.S.C. 3679(c).
     iv. Anyone using benefits under the Marine Gunnery Sergeant John David Fry Scholarship who lives in the state in which the institution is located (regardless of formal state residence).< >Except...Surviving spouses can use the Fry Scholarship for 15 years from the anniversary of the service member's death or until they remarry.{C}Eligible children can use the Fry Scholarship between the ages of 18 and 33.{C}Download Application for Those Separated from the Military

- **Economic Advantage**
  As of the first day of classes for the term, an economic advantage waiver may be granted to a U.S. citizen or U.S. legal permanent resident who is a dependent or independent student and can provide clear evidence that the student or the student's parent, spouse, or U.S. court-appointed legal guardian has relocated to the State of Georgia to accept full-time, self-sustaining employment and has established domicile in the State of Georgia. Relocation to the state must be for reasons other than enrolling in an institution of higher education. For U.S. citizens or U.S. legal permanent residents, this waiver will expire 12 months from the date the waiver was granted.
  As of the first day of classes for the term, an economic advantage waiver may be granted to an independent non-citizen possessing a valid employment-related visa status who can provide clear evidence of having relocated to the State of Georgia to accept full-time, self-sustaining employment. Relocation to the state must be for employment reasons and not for the purpose of enrolling in an institution of higher education. These individuals must be able to show clear evidence of having taken legally permissible steps toward establishing legal permanent residence in the United States and the establishment of legal domicile in the State of Georgia. Independent non-citizen students may continue to receive this waiver as long as they maintain a valid employment-related visa status and can demonstrate continued efforts to establish U.S. legal permanent residence and legal domicile in the State of Georgia.
  A dependent non-citizen student who can provide clear evidence that the student's parent, spouse, or U.S. court-appointed legal guardian possesses a valid employment-related visa status and can provide clear evidence of having relocated to the State of Georgia to accept full-time, self-sustaining employment is also eligible to receive this waiver. Relocation to the state must be for employment reasons and not for the purpose of enrolling in an institution of higher education. These individuals must be able to show clear evidence of having taken legally permissible steps toward establishing legal permanent residence in the United States and the establishment of legal domicile in the State of Georgia. Non-citizen students currently receiving a waiver who are dependents of a parent, spouse, or U.S. court-appointed legal guardian possessing a valid employment-related visa status may continue to receive this waiver as long as they can demonstrate that their parent, spouse, or U.S. court-appointed legal guardian is maintaining full-time, self-sustaining employment in Georgia and is continuing efforts to pursue an adjustment of status to U.S. legal permanent resident and the establishment of legal domicile in the State of Georgia. (BR Minutes, October 2008.)

Download Application for Economic Advantage

- **Non-Resident Students**
  As of the first day of classes for the term, a non-resident student can be considered for this waiver under the following conditions:
  - Students under 24.
    - If the parent, or United States court-appointed legal guardian has maintained domicile in Georgia for at least twelve (12) consecutive months and the student can provide clear and legal evidence showing the relationship to the parent or United States court-appointed legal guardian has existed for at least twelve (12) consecutive months immediately preceding the first day of classes for the term. Under Georgia code, legal guardianship must be established prior to the student's 18th birthday (BoR Minutes, October 2008, title amended February 2010); or
    - If the student can provide clear and legal evidence showing a familial relationship to the spouse and the spouse has maintained domicile in Georgia for at least twelve (12) consecutive months immediately preceding the first day of classes for the term (BoR Minutes, February 2010).
  - Students 24 and Older.
    - If the student can provide clear and legal evidence showing a familial relationship to the spouse and the spouse has maintained domicile in Georgia for at least twelve (12) consecutive months immediately preceding the first day of classes for the term. This waiver can remain in effect as long as the student remains continuously enrolled (BoR Minutes, October 2008, title amended February 2010).

This waiver can remain in effect as long as the student remains continuously enrolled (BoR Minutes, October 2008).

Download Application for Non-Resident Students

Outside Sponsorships

A student whose tuition and fees are to be paid by a corporate or government sponsor must notify the Bursar's Office by submitting an authorization or voucher from the sponsor on original letterhead and signed by an official authorized to obligate payment by the organization per the specifics outlined here. Authorizations must be received before the payment deadline each semester. Payment deadlines for upcoming terms are published on the Bursar's Calendar. As a courtesy to students, the Bursar's Office sends a billing statement to the sponsor after the Registration Period ends. A student whose sponsor fails to pay the authorized charges will have their conditional credit reversed and will be responsible for the unpaid charges. A financial hold will be placed on the student's account until the balance is paid in full. Students are encouraged to remain in contact with their sponsor until all terms of a billing authorization are met.

Important links:

- Bursar's Office | Third-Party Blling
- Bursar's Office | Bursar's Calendar

62 and Older Student Waiver

Georgia residents who are aged 62 and older may be eligible to take courses on a space available basis at little or no cost.As of the first day of classes for the term, a waiver of in-state tuition and fees may be granted to a legal resident of Georgia aged 62 and over. This waiver can remain in effect as long as the student is continuously enrolled.

For more information, please visit: https://registrar.gatech.edu/prospective-students/62-or-older

President's Scholarship Program

The Stamps President's Scholars Program is Georgia Tech's premier and most prestigious merit-based scholarship. Recipients are selected from the top applicants for admission to Georgia Tech based on demonstrated excellence in scholarship, leadership, progress, and service as described on the Stamps President's Scholars Program web page. From the applicant pool, students selected as semifinalists interview online. The top semifinalists are named finalists and invited, with their parents, to campus for additional interviews and an information weekend in March or April.

Transfer students are not eligible for the four-year award. Recipients must be US/UK/Ireland Citizens or US/UK Permanent Residents.

Each year, 40 incoming first-year students receive the Stamps President's Scholarship, which is renewable for up to four academic years or eight semesters, contingent upon honors-level performance and continued leadership development as evidenced by involvement in program, campus, and community activities. Scholarships are "full ride," including tuition and mandatory fees, room and board, books, and personal expenses. See the website below for more information on stipends.

To ensure consideration, a student must apply as an incoming first-year student, and submit the Georgia Tech Application for First-Year Admission, along with the application fee by the relevant early action deadline.

More information:

- Stamps President's Scholars Program

Veterans Services

Veterans Services at Georgia Tech is not a division of the US Department of Veterans Affairs (DVA) but part of the Office of the Registrar. It serves as a liaison between veteran students and the DVA. Its primary purposes are to assist veteran students with the processing of forms for educational benefits, to advise veteran students about certain procedural requirements, and to certify enrollment of Georgia Tech veteran students to the Department of Veterans Affairs.

Because the US Department of Veterans Affairs (DVA) must receive certification of enrollment before issuing benefit payments, any student planning to enroll under any of the DVA's programs should initiate the certification procedure through the Office of the Registrar as early as possible.

Veterans must apply to Georgia Tech through the regular admissions procedure. Eligibility for DVA benefits does not guarantee acceptance into the Institute, nor does acceptance signify eligibility for DVA benefits. The Institute serves only as a source of certification and information to the DVA; the student must carry out all financial transactions with the US Department of Veterans Affairs directly.

- Contact Information
- DoD Tuition Assistance
- Starting Benefits

- Types of Benefits
- Certification Process
- Frequently Used Forms
- Additional Information

Contact Information

GT School Certifying Official (SCO):
veterans@registrar.gatech.edu
phone: 404.894.4953
fax: 404.894.0167

GT Veterans Resource Center:
311 Ferst Dr.
Atlanta, GA 30318
phone: 404.385.2067

Department of Veterans Affairs
Atlanta Regional Office
P.O. Box 100026
Decatur, GA 30031-7026
atlrpo@vba.va.gov

US Department of Veterans Affairs:
Online Queries
www.gibill.va.gov
1.888.GIBILL.1
1.888.422.4551

Starting Benefits

Before a student can use GI Bill® education benefits, she/he must be formally admitted to Georgia Tech. Prospective students who need information about applying should see the Undergraduate Admissions web site. Individuals who intend to utilize GI Bill® education benefits are admitted by the same standards as any other students.

Those who intend to utilize GI Bill® education benefits for the first time should apply for these benefits least two months before the start of the first academic term in which they will be enrolled as students at Georgia Tech.

First-Time GI Bill® Applicants

If the student has already applied for GI Bill® Education Benefits

- After a student applies for education benefits, the US Department of Veterans Affairs (DVA) sends a Certificate of Eligibility (COE) letter indicating the type of benefit awarded and the terms of eligibility under that benefit. A copy of this letter must be submitted to Ansley Sharp, the School Certifying Official (SCO) at Georgia Tech, via fax at 404.894.0167 or e-mail at veterans@registrar.gatech.edu.

If the student need to apply for GI Bill® Education Benefits

- If the student is the veteran
  - Veterans enrolling at Georgia Tech must apply for benefits through the GI Bill® web site.
  - After a student applies for education benefits, the US Department of Veterans Affairs (DVA) sends a Certificate of Eligibility (COE) letter indicating the type of benefit awarded and the terms of eligibility under that benefit. A copy of this letter must be submitted to Ansley Sharp, the School Certifying Official (SCO) at Georgia Tech, via fax at 404.894.0167 or e-mail at veterans@registrar.gatech.edu.
- If the student is the dependent or spouse of the veteran
  - A veteran may transfer Ch 33 Post 9/11 GI Bill® benefits to a family member with the approval of the US Department of Defence (DoD). Information regarding transfer of benefits is available on the GI Bill® web site. Once the DoD approves transfer of benefits, the family member must submit Form 22-1990e, "Application for Family Member to Use Transferred Benefits," online or by mailing the printable form to the address below:
    Department of Veterans Affairs
    VA Regional Office
    P.O. Box 8888
    Muskogee, OK 74402-8888
  - After family member applies for education benefits, the Department of Veterans Affairs (DVA) sends a Certificate of Eligibility (COE) letter indicating the type of benefit awarded and the terms of eligibility under that benefit. A copy of this letter must be submitted to Ansley Sharp, the School Certifying Official (SCO) at Georgia Tech, via fax at 404.894.0167 or e-mail at veterans@registrar.gatech.edu.

Transferring GI Bill® Education Benefits to Georgia Tech

- A student who has used GI Bill® Education Benefits at another college or university must complete Form 22-1995, "Request for Change of Program or Place of Training." This form may be submitted online or by mailing the printable form to the address below:
  Department of Veterans Affairs
  VA Regional Office
  P.O. Box 8888
  Muskogee, OK 74402-8888

Signing Up for Yellow Ribbon

- A formally admitted student who is eligible and who has already sent a copy of her/his Certificate of Eligibility (COE) letter to the School Certifying Official (SCO) may be added to either the Yellow Ribbon participant list or the waiting list. Yellow Ribbon is given on a first-come, first-served basis. If all 40 participant slots are taken when a student completes the Yellow Ribbon Participation Request Form, the student will be placed on a waiting list until a slot becomes available.
- The Yellow Ribbon Participation Request Form is submitted only once. After student is given a participant slot for the Yellow Ribbon program, she/he is eligible to receive this benefit until she/he exhausts her/his Ch 33 benefits, graduates, or stops attending Georgia Tech (e.g., loses registration eligibility by absence or failure to participate in scheduled classes).

Types of Benefits

The Department of Veterans Affairs (DVA) administers a variety of education benefit programs. Many veterans and active duty personnel can qualify for education benefits. Currently, Georgia Tech participates in the following programs:

- Chapter 33, The Post-9/11 GI Bill® (Yellow Ribbon)
- Chapter 30, Montgomery GI Bill® - Active Duty (MGIB-AD)
- Chapter 35, Survivors' and Dependents' Educational Assistance Program (DEA)

- 1606 - Montgomery GI Bill® - Selected Reserve (MGIB-SR)
- Chapter 31, Veteran Readiness and Employment (VR&E)

Certification Process

The School Certifying Official (SCO) releases an email to notify veteran students that initial enrollment certifications will be submitted 45 days before the start of the academic term. At this time, students may ask any questions or request to not be certified. Submitting the initial enrollment certification 45 days prior to the start of the semester ensures that students' first monthly stipend will be issued on time.

For students under Chapter 33 Post-9/11 GI Bill® (Yellow Ribbon), this is the first of two certifications. The first certification reports a student's enrollment for her/his monthly stipend. The second certification reports tuition and mandatory student fees (and Yellow Ribbon funding if applicable) after the Phase 2 Registration Period ends.

The Office of the Bursar places a deferral on each Chapter 33 student's account for the amount expected from the DVA. This deferral prevents the assessment of late fees or schedule cancellation due to the student's account balance. Students should make plans to pay whatever balance is not covered by Chapter 33 (e.g., housing, parking, meal plan) before the regular payment deadlines.

Students' Responsibilities

Veteran students at Georgia Tech have ongoing responsibilities to the Department of Veterans Affairs. The DVA and the Veterans Services office at Georgia Tech closely monitor each veteran student's enrollment status and academic program. The student's entitlement is based upon the number of credit hours for which a student is enrolled and any changes in academic program. To ensure that a student's enrollment is certified to the DVA accurately, the student must abide by the following requirements:

- Check the Georgia Tech Veterans Services web page for current news
- Read all notification emails from the School Certifying Official (SCO)
- Email the SCO if adjustments are made to class schedule during the Phase 2 Registration Period
- Email the SCO if adjustments need to be made to schedule after the Phase 2 Registration Period ends
- Email the SCO if changing address or academic major

Frequently Used Forms

Below are the most frequently used printable forms. All other printable forms may be found in the Forms Library the DVA web site.

- Printable forms should be mailed to the DVA regional office in Atlanta.
  Department of Veterans Affairs
  VA Regional Office
  P.O. Box 8888
  Muskogee, OK 74402-8888

- Form 22-1990, Application for VA Education Benefits
- Form 22-1990e, Application for Family Member to Use Transferred Benefits
- Form 22-1995, Request for Change of Program or Place of Training
- Form 22-5495, Dependents' Request for Change of Program or Place of Training
- VA Course Withdrawal Form
- Tuition Assistance Withdrawal Form
- Yellow Ribbon Participation Request Form
- Mandatory Student Fee Waiver Form for Active Duty Military and Veterans

Additional Information

More information is available on the Office of the Registrar's web site on the Veterans Services' Frequently Asked Questions (FAQ) page.

GI Bill® is a registered trademark of the U.S. Department of Veterans Affairs (VA). More information about education benefits offered by VA is available at the official U.S. government Web site at https://www.benefits.va.gov/gibill.

Billing

A complete itemized statement of the student account is available online to students and authorized users. Georgia Tech does not mail invoices to students.

To access a student's account, go to Buzzport and click the PayNow–Bursar icon on the Home or Student tab, or go to the Pay Now links on the Bursar's website, Payment Instructions, at bursar.gatech.edu. A student or authorized user logs into the Bill+Payment portal with their credentials. Registration changes impacting tuition and fee charges, as well as online payments, are updated in real time to show the most current information on the account. Parking, Meal Plan, and other auxiliary charges are uploaded daily to the student account. Tuition and other charges are subject to change without notice.

Notices from the Bursar's Office concerning a student account are sent to the student's Georgia Tech e-mail account, which is the Institute's official means of communication with students. It is the student's responsibility to ensure all requirements of their account are satisfied by the payment deadline for a term. Questions concerning charges, payments, or credit balances on the student account should be directed to the Bursar's Office. Verbal misinformation is not grounds for waiver of a regulation.

Additional details are available on the Bursar's web site.

- Student Payment Instructions
- Parent Payment Instructions
- Cost of Attendance

Official policies are available in the Georgia Tech Policy Library.

- Code of Conduct Regarding Private Lending and Student Choice
- Grade Substitution Policy
- Institute Policy for Scholarship/Fellowship Payments and the Payment of Prizes/Awards to Students
- Mandatory Student Insurance
- Refunds
- Satisfactory Academic Progress
- Student Appeals
- Voluntary Student Fees

Cancellation of Registration

Students who register for classes and do not attend must cancel their classes online. Failure to do so will result in awarded financial aid being applied to the student's account, and the student receiving a grade of "F" in each course.

All students must be aware of Georgia Tech's policies and processes regarding Verification of Participation.

Fees

Paying Tuition and Fees

Tuition and fees are payable by the deadline published on the official Academic Calendar and the Bursar's Office web page for each academic term. Registration is not complete until all charges are paid. The Institute reserves the right at any time during the semester to drop any student from classes for failure to pay their balance in full. In no case is a regulation waived or an exception granted because a student pleads ignorance of the regulation or asserts they were not informed of it by an adviser or other authority. Students who owe the Institute money and have been placed on "hold" because of failure to pay may have their account forwarded to a professional collection agency.

Payment may be made by check payable in U.S. currency and drawn on a financial institution located in the U.S. (with checking account encoded on the check and made payable to Georgia Institute of Technology), or cashier's check. Credit card payments and electronic checks (WebChecks) are accepted online through the Bill+Payment portal. Credit card payments are processed by a third party vendor which charges a 2.85 percent fee for this service. A fee is not charged for WebCheck transactions. Credit card payments cannot be made by mail, phone, fax, or in person.

Tuition and Fee Rates

The tuition and fees listed are estimates and are subject to change. These amounts should be used only as a planning guide for future payments. Tuition charges can vary based on state residency status and degree program of study. Residency status is determined by the Office of Admission at the time of acceptance. Students are either classified as a resident or nonresident of Georgia for tuition purposes in accordance with the regulations of the Board of Regents of the University System of Georgia. The most current information on tuition and fees is available at http://www.bursar.gatech.edu/content/tuition-fees.

Mandatory Student Fees

Published student fees are subject to change and should be considered estimates for use in planning future payments. Students registered for four or more credit hours in one academic term are charged all mandatory student fees which are due at the same time as tuition charges. Mandatory student fees are considered part of the registration process and must be paid in full for the student to be considered enrolled. The Activity Fee, Athletic Fee, CRC Operations Fee, Campus Center Facility Fee, Health Fee, Recreation Facility Fee, Student Campus Center Operations Fee, Special Institutional Fee, Technology Fee, and Transportation Fee are mandatory student fees used to provide cultural, social, and athletic programs for the entire student body. In addition, these fees provide financial support for student facilities at the Institute, guest speakers and lecturers, student publications, and many special events that are available exclusively for Georgia Tech students. The Transportation Fee assists in defraying shuttle costs for transporting students. The Technology Fee supports the infrastructure necessary to provide students with the latest online computing services technology. Students registering for fewer than four credit hours in one academic term are required to pay the Special Institutional Fee, Technology Fee, and Transportation Fee. See https://www.bursar.gatech.edu/tuition-fees for current information.

Late Registration Fees

Students who do not meet payment deadlines may incur penalty fees. If a student does not pay all required fees by the published payment deadlines (https://www.bursar.gatech.edu/calendar) registration may be canceled. The late payment fee is currently $100. If registration is canceled, the reinstatement fee is $200. Reinstatement is not guaranteed.

Payment

Fee Payment

All fees are payable by the deadline published on the official Academic Calendar and the Bursar's Office web page for each academic term. Registration is not complete until all fees are paid. The Institute reserves the right at any time during the semester to drop any student from classes for failure to pay fees. In no case is a regulation waived or an exception granted because a student pleads ignorance of the regulation or asserts that they were not informed of it by an advisor or other authority. Students who owe the Institute money and have been placed on "hold" for failure to pay may have their account forwarded to a professional collection agency.

Payment may be made by check payable in U.S. currency and drawn on a financial institution located in the U.S. (checking account number encoded on the check and made payable to Georgia Institute of Technology) or cashier's check. Payments may also be made online by electronic check (WebCheck) or credit card. Credit card payments may only be made via the Student Information System and are processed by a third party vendor which charges a 2.85 percent fee for this service. A fee is not charged for WebCheck transactions. Credit card payments cannot be made by mail, phone, fax, or in person.

Choosing a Payment Option

Online By Credit Card or WebCheck

The Bursar's Office accepts WebChecks and credit card payments online. To make a payment for an account, go to Buzzport and select the PayNow—Bursar icon on the Home or Student tab.

By Mail

Checks or money orders should be made payable to Georgia Institute of Technology. The student's identification number must be clearly notated on checks or money orders. Payments must be received (not postmarked) by 4:00 p.m., Eastern Time, on the payment deadline date. Mail payments to the following address:

Georgia Institute of Technology
Office of the Bursar
Suite 111 Lyman Hall
225 North Avenue
Atlanta, Georgia 30332-0255

In Person

Payment by check or money order may be deposited in the drop box, located in the entry vestibule to Lyman Hall, at any hour of the day before the payment deadline. Checks should be payable to Georgia Institute of Technology. Notate the student's identification number on the memo line.

Fee Payment Using Financial Aid

Financial aid, including scholarships and fellowships, and tuition waivers are disbursed to the student's account and applied to any outstanding

balances. Financial aid is initially estimated before it is disbursed. The Balance Due for a student is reduced by this estimated amount. Disbursements begin approximately one week prior to the payment deadline. It is the student's responsibility to ensure all funds are properly credited by the payment deadline date by reviewing their online invoice. If funds are not disbursed or credited by the payment deadline, a student may be eligible to request a payment deferment from the Office of Scholarships and Financial Aid. Deferments must be requested and may be granted for the lesser of the financial aid award or the amount due to the Institute.

Disbursement of Financial Aid Refunds

Financial aid processed by the Office of Scholarships and Financial Aid is applied directly to the student's account in the Bursar's Office. If a credit balance exists after all charges are posted and paid, the Bursar's Office will refund the credit amount to the student's bank account. Many financial aid programs - including Zell and HOPE scholarships, Federal Pell Grant, and Stafford Loan - do not require full time enrollment for disbursement to occur. However, because some scholarships and grants require full-time study, and some aid programs require course registration of at least six hours for disbursement, students who are planning to enroll for fewer than twelve hours and are unsure of the requirements, are advised to seek clarification from the Office of Scholarships and Financial Aid.

Important links:

- The Office of Scholarships and Financial Aid

Returned Check Payments

If a check is returned from the bank (for insufficient funds or stop payment), the student is required to redeem the returned check with a cashier's check in the Bursar's Office. A returned check fee will be added to the amount due. Returned checks remaining unredeemed after a reasonable period of time may be forwarded to a collection agency. Students who have two checks returned against their Georgia Tech account will be denied future check writing privileges.

If a student intends to withdraw from Georgia Tech, it is the student's responsibility to formally withdraw by following the Procedures for Withdrawal and Dropping Courses on the Registrar's Office website.

Important links:

- Registrar's Office | Procedures for Withdrawal and Dropping Courses
- Bursar's Office | Policy on Returned Checks

Refunds

Refunds for Students with Financial Aid

For students withdrawing from school, a calculation is made on any financial aid received to determine whether a student who completely withdraws during a term has "earned" the monies disbursed. Students "earn" their aid based on the period of time they were enrolled. During the first 60 percent of the term, a student earns financial aid funds in direct proportion to the length of time the student was enrolled. Beyond the 60 percentage point, all aid is considered earned. The responsibility to repay "unearned" aid is shared by the Institute and the student in proportion to the aid each is assumed to possess. The most current refund schedule can be found at http://www.bursar.gatech.edu/content/refund-calendars.

If a student intends to withdraw from Georgia Tech, it is the student's responsibility to formally withdraw by following the Withdrawal From School Procedures on the Registrar's website.

Refund Policy

The refund amount for students withdrawing from the Institute shall be based on a pro rata percentage determined by dividing the number of calendar days in the semester that the student completed by the total number of calendar days in the semester. The total number of calendar days in a semester is calculated by using the first day of class through the last day of final exams for the Institute and excludes scheduled breaks of five or more consecutive days. Institutional charges are refunded up to the point in time that the percentage equals 60 percent. Students who withdraw from the Institute when the calculated percentage of completion is greater than 60 percent are not entitled to a refund of any portion of institutional charges. A full refund (100 percent) is available to students who fully withdraw from the Institute or to students who drop individual courses by the end of late registration, if the reduction in hours changes their tuition tier under the flat rate tuition model. No further refunds are given for individual classes dropped after the end of late registration.

Students suspended or expelled from the Institute for any reason forfeit their right to a refund of any credit balance on their student account.

Refund Information

Withdrawal Information

Student Financial Agreement

By registering for classes at the Georgia Institute of Technology (Georgia Tech), I agree to the following terms and conditions:

1. I accept full responsibility for payment of all tuition, fees and other associated costs assessed as a result of my class registration and/or receipt of services at Georgia Tech. I understand Georgia Tech uses electronic billing as the official billing method and does not mail invoices. I am responsible for reviewing and paying my student account balance by the scheduled due date. I further understand failure to review my account does not constitute a valid reason for non-payment by the scheduled due date.
2. If I drop or withdraw from some or all classes for which I register, I accept responsibility for paying all tuition and mandatory fees in accordance with the published tuition refund schedule at http://www.bursar.gatech.edu/content/refund-calendars. I further understand non-attendance does not absolve me of this responsibility.
3. I agree my financial aid is to be used to pay charges assessed to my account at Georgia Tech such as tuition, fees, campus housing and meal plans, student health insurance, parking permits, service fees, fines, bookstore charges, or any other charge, in accordance with the terms of the aid. If any portion of my financial aid is revoked, I agree to repay all revoked aid that was disbursed to my account and either applied to charges or refunded to me.
4. I understand if I fail to pay my student account bill or any monies owed to Georgia Tech by the scheduled due date, Georgia Tech will place a financial hold on my student account, preventing me from registering for future classes, requesting transcripts, or receiving my diploma. Georgia Tech may also assess late payment fees and/or cancel my class registration.

5. I understand if I fail to pay my student account bill or any monies owed to Georgia Tech by the scheduled due date, and also fail to make acceptable payment arrangements to bring my account current, Georgia Tech may refer my delinquent account to a collection agency. I further understand that if Georgia Tech refers my student account balance to a third party for collection, a collection fee will be assessed and due in full at the time of the referral to the third party. The collection fee will be calculated as a percentage at a maximum of fifteen (15) percent of my delinquent account. Further, I understand that my delinquent account may be reported to one or more of the national credit bureaus.
6. I understand Georgia Tech and its agents and contractors may contact me at my current and any future cellular phone number(s), email address(es) or wireless device(s) regarding my delinquent student account(s)/loan(s), any other debt I owe to Georgia Tech, or to receive general information. I authorize Georgia Tech and its agents and contractors to use automated telephone dialing equipment, artificial or pre-recorded voice or text messages, and personal calls and emails, in their efforts to contact me. I may withdraw my consent to call my cellular phone using automated telephone dialing equipment by submitting my request in writing to the Georgia Tech Bursar's Office or in writing to the applicable contractor or agent contacting me on behalf of Georgia Tech.
7. I understand I am responsible for complying with all applicable Georgia Tech policies and procedures.
8. I understand Georgia Tech uses the e-mail account provided by the institution as the official method of communication with me and I am responsible for reading Georgia Tech e-mails on a timely basis.
9. I understand I am responsible for keeping Georgia Tech records up to date with my current physical addresses, email addresses, and phone numbers by following the procedure at http://www.registrar.gatech.edu/students/formlanding/address.php. The linked procedure is incorporated herein by reference. Upon leaving Georgia Tech for any reason, it is my responsibility to provide Georgia Tech with updated contact information for purposes of continued communication regarding any amounts owed to Georgia Tech.
10. I understand that this Agreement shall be governed by the laws of the state of Georgia without regard to choice of law provisions and that all actions arising under this agreement will be filed and litigated exclusively in the state or federal courts in Atlanta, Georgia and I expressly agree to the jurisdiction of such courts.

Tuition

Tuition and Fee Rates

Published tuition and fees listed are subject to change. These amounts should be used only as a planning guide for future payments. Tuition charges can vary based on state residency status and degree program of study. Residency status is determined by the Office of Admission at the time of acceptance. Students are either classified as a "resident" or "nonresident" of Georgia for tuition purposes in accordance with the regulations of the Board of Regents of the University System of Georgia. The most current information on tuition and fees is available from the Bursar's Office.

More information:

- Out-of-State Tuition Waivers
- Tuition Classification

Out-of-State Tuition Waivers

Georgia Tech has permission from the Board of Regents to award out-of-state tuition differential waivers and assess in-state tuition for certain nonresidents of Georgia for the following reasons and under the following conditions. The waivers processed in the Office of the Registrar are listed below. Any student requesting to pay at the in-state tuition rate will be required to provide verification of their lawful presence in the United States in order to be classified as an in-state student or awarded an out-of-state tuition waiver. See Lawful Presence.

- **University System Employees and Dependents**
  Full-time employees of the University System, their spouses, and their dependent children.
  Download Application for USG Employess and Dependents

- **Full-time School Employees**
  Full-time employees in the public schools of Georgia or the Technical College System of Georgia, their spouses, and their dependent children. Teachers employed full-time on military bases in Georgia shall also qualify for this waiver (BR Minutes, 1988-89, p.43).
  Download Application for Full-Time School Employees

- **Career Consular Officials**
  Career consular officers, their spouses, and their dependent children who are citizens of the foreign nation that their Consulate office represents and who are stationed and living in Georgia under orders of their respective governments.
  Download Application for Career Consular Officials

- **Military**
  1. Active duty military personnel, their spouses, and their dependent children who meet one of the following:
     a. The military sponsor is currently stationed in or assigned to Georgia; or,
     b. The military sponsor previously stationed in or assigned to Georgia is reassigned outside of Georgia, and the student(s) remain (s) continuously enrolled in a Georgia school, Technical College System of Georgia institution, and/or a University System of Georgia institution; or,
     c. The military sponsor is reassigned outside of Georgia and the spouse and/or dependent children remain in Georgia; or,
     d. The military sponsor is stationed in a state contiguous to the Georgia border and resides in Georgia; or,
     e. Dependent children of a military sponsor, previously stationed in or assigned to Georgia within the previous five years, or the child completed at least one year of high school in Georgia; or,
     f. Any student utilizing VA educational benefits transferred from a currently serving military member is also eligible, even if the student is no longer a dependent of the transferor.
        - Download Application for Active Duty Military Personnel
  2. Active members of the Georgia National Guard stationed or assigned to Georgia or active members of a unit of the U.S. Military Reserves based in Georgia, and their spouses and their dependent children (BoR Minutes, October 2008).
     - Download Application for GA National Guard and Reservists
  3. Separated military members from a uniformed military service of the United States who meet one of the following (BoR Minutes, June 2004; October 2008; October 2013: March 2016; May 2017):
     a. Individuals who within thirty-six (36) months of separation from such service, enroll in an academic program and

demonstrate intent to become domiciled in Georgia. This waiver may also be granted to their spouses and dependent children.

b. Any separated service member or any student utilizing transferred VA educational benefits, and physically residing in the state.
c. Any individual as described in 38 U.S.C. 3679(c).
d. Anyone using benefits under the Marine Gunnery Sergeant John David Fry Scholarship who lives in the state in which the institution is located (regardless of formal state residence).
   - Except...
     - Surviving spouses can use the Fry Scholarship for 15 years from the anniversary of the service member's death or until they remarry.
     - Eligible children can use the Fry Scholarship between the ages of 18 and 33.
   - Download Application for Those Separated from the Military

- **Economic Advantage**
  As of the first day of classes for the term, an economic advantage waiver may be granted to a U.S. citizen or U.S. legal permanent resident who is a dependent or independent student and can provide clear evidence that the student or the student's parent, spouse, or U.S. court-appointed legal guardian has relocated to the State of Georgia to accept full-time, self-sustaining employment and has established domicile in the State of Georgia. Relocation to the state must be for reasons other than enrolling in an institution of higher education. For U.S. citizens or U.S. legal permanent residents, this waiver will expire 12 months from the date the waiver was granted.
  As of the first day of classes for the term, an economic advantage waiver may be granted to an independent non-citizen possessing a valid employment-related visa status who can provide clear evidence of having relocated to the State of Georgia to accept full-time, self-sustaining employment. Relocation to the state must be for employment reasons and not for the purpose of enrolling in an institution of higher education. These individuals must be able to show clear evidence of having taken legally permissible steps toward establishing legal permanent residence in the United States and the establishment of legal domicile in the State of Georgia. Independent non-citizen students may continue to receive this waiver as long as they maintain a valid employment-related visa status and can demonstrate continued efforts to establish U.S. legal permanent residence and legal domicile in the State of Georgia.
  A dependent non-citizen student who can provide clear evidence that the student's parent, spouse, or U.S. court-appointed legal guardian possesses a valid employment-related visa status and can provide clear evidence of having relocated to the State of Georgia to accept full-time, self-sustaining employment is also eligible to receive this waiver. Relocation to the state must be for employment reasons and not for the purpose of enrolling in an institution of higher education. These individuals must be able to show clear evidence of having taken legally permissible steps toward establishing legal permanent residence in the United States and the establishment of legal domicile in the State of Georgia. Non-citizen students currently receiving a waiver who are dependents of a parent, spouse, or U.S. court-appointed legal guardian possessing a valid employment-related visa status may continue to receive this waiver as long as they can demonstrate that their parent, spouse, or U.S. court-appointed legal guardian is maintaining full-time, self-sustaining employment in Georgia and is continuing efforts to pursue an adjustment of status to U.S. legal permanent resident and the establishment of legal domicile in the State of Georgia. (BR Minutes, October 2008.)
  Download Application for Economic Advantage

- **Non-Resident Students**
  As of the first day of classes for the term, a non-resident student can be considered for this waiver under the following conditions:
  - Students under 24.
    - If the parent, or United States court-appointed legal guardian has maintained domicile in Georgia for at least twelve (12) consecutive months and the student can provide clear and legal evidence showing the relationship to the parent or United States court-appointed legal guardian has existed for at least twelve (12) consecutive months immediately preceding the first day of classes for the term. Under Georgia code, legal guardianship must be established prior to the student's 18th birthday (BoR Minutes, October 2008, title amended February 2010); or
    - If the student can provide clear and legal evidence showing a familial relationship to the spouse and the spouse has maintained domicile in Georgia for at least twelve (12) consecutive months immediately preceding the first day of classes for the term (BoR Minutes, February 2010).
  - Students 24 and Older.
    - If the student can provide clear and legal evidence showing a familial relationship to the spouse and the spouse has maintained domicile in Georgia for at least twelve (12) consecutive months immediately preceding the first day of classes for the term. This waiver can remain in effect as long as the student remains continuously enrolled (BoR Minutes, October 2008, title amended February 2010).

This waiver can remain in effect as long as the student remains continuously enrolled (BoR Minutes, October 2008).

Download Application for Non-Resident Students

- **Senior Citizen Waiver**
  A s of the first day of classes for the term, a waiver of in-state tuition and fees may be granted to a legal resident of Georgia aged 62 and over. This waiver can remain in effect as long as the student is continuously enrolled.
  Download Application for Senior Citizens

Students who come to Georgia Tech from another state and work for companies in Georgia remain ineligible for in-state tuition in the absence of compelling evidence of intent to remain in Georgia permanently. Having Georgia voter registration, having employment in any position normally filled by a student (such as co-op, graduate research assistant, or graduate teaching assistant), having a lease of living quarters, having a Georgia automobile registration, and having Georgia driver's license do not constitute sufficient evidence of domicile to affect classification as an in-state student under the Board of Regents' policy.

For further information concerning residency, students should contact the Residency Office in Room 112 of TechTower, write to the Office of the Registrar, Residency, Georgia Tech, Atlanta, GA 30332-0315, or email comments@registrar.gatech.edu. The Residency Office must receive an application for classification as a legal resident for fee payment purposes no later than one month prior to the academic registration date for the term in which the student seeks to pay fees as a resident

of Georgia. Requests for tuition waivers must be received by the Office of the Registrar no later than the first day of classes for the term for which the out-of-state tuition is to be waived. See the official Academic Calendar for dates.

Tuition Classification

Classification of Students for Tuition Purposes

Under the Constitution and laws of Georgia, the Board of Regents of the University System of Georgia was created to govern, control, and manage a system of public institutions providing quality higher education for the benefit of Georgia citizens. The state, in turn, receives substantial benefit from individuals who attend or have attended these institutions through their significant contributions to the civic, political, economic, and social advancement of the citizens of Georgia.

Because the overwhelming proportion of financial support for the operation of the public institutions of higher education in Georgia comes from the citizens through the payment of taxes, the determination of whether a student is classified as a resident or a nonresident of the state for tuition purposes becomes a significant matter. The tuition paid by in-state students covers only about one-fourth of the total cost of their education in the University System. Therefore, Georgia taxpayers are contributing three-fourths of the necessary funds to provide quality education for the citizens of the state.

The practice followed by state colleges and universities of assessing out-of-state students a higher tuition rate is a rational attempt by states to achieve a partial cost equalization between those who have and those who have not recently contributed to the state's economy, even though no precise way exists to determine the degree to which higher tuition charges equalize the cost of educating in-state and out-of-state students.

Courts that have been faced with challenges to residency classification procedures have consistently recognized the right of public institutions of higher education to charge higher rates to out-of-state students and to adopt reasonable criteria for determining the establishment of in-state status.

For the purpose of these regulations, the question to be answered is not primarily whether a student is a resident or nonresident of Georgia, but whether the student should pay University System fees on an in-state basis. The term "resident" is confusing because it may have several definitions as it relates to voter registration, driver's licenses, automobile registration, deeds, contracts, wills, income taxes, and other matters. A student may be a resident of Georgia for some purposes, but not entitled to in-state status for tuition purposes.

The Board of Regents has adopted certain policies governing the classification of students as residents and nonresidents for tuition purposes in keeping with its responsibilities to the citizens of Georgia for an appropriate assessment of fees and reasonable share of the cost of their education. The taxpayers of Georgia are thereby assured that they are not assuming the financial burden of educating persons whose presence in the state is not intended to be permanent.

With these considerations in mind, the Board of Regents has adopted the following policies governing the classification of students for fee payment purposes:

http://www.usg.edu/policymanual/section4/policy/4.3_student_residency/

1. United States Citizens
   a. An independent student who has established and maintained a domicile in the State of Georgia for a period of at least twelve consecutive months immediately preceding the first day of classes for the term shall be classified as "in-state" for tuition purposes.

      It is presumed that no student shall have gained or acquired in-state classification while attending any postsecondary educational institution in this state without clear evidence of having established domicile in Georgia for purposes other than attending a postsecondary educational institution in this state.

   b. A dependent student shall be classified as "in-state" for tuition purposes if either:

      i. the dependent student's parent has established and maintained domicile in the State of Georgia for at least twelve consecutive months immediately preceding the first day of classes for the term and the student has graduated from a Georgia high school or

      ii. the dependent student's parent has established and maintained domicile in the State of Georgia for at least twelve consecutive months immediately preceding the first day of classes for the term and the parent claimed the student as a dependent on the parent's most recent federal income tax return.

   c. A dependent student shall be classified as "in-state" for tuition purposes if a U.S. court-appointed legal guardian has established and maintained domicile in the State of Georgia for at least twelve consecutive months immediately preceding the first day of classes for the term, provided that appointment was not made to avoid payment of out-of-state tuition and the U.S. court-appointed legal guardian can provide clear evidence of having established and maintained domicile in the State of Georgia for a period of at least twelve consecutive months immediately preceding the first day of classes for the term.

   d. If an independent student classified as "in-state" relocates temporarily but returns to the State of Georgia within 12 months, the student shall be entitled to retain in-state tuition classification.

   e. If the parent or U.S. court-appointed legal guardian of a dependent student currently classified as "in-state" for tuition purposes establishes domicile outside of Georgia after having established and maintained domicile in the State of Georgia, the student may retain in-state tuition classification as long as the student remains continuously enrolled in a public postsecondary educational institution in the state, regardless of the domicile of the parent or U.S. court-appointed legal guardian.

2. Noncitizens
   Noncitizens initially shall not be classified as "in-state" for tuition purposes unless there is evidence to warrant consideration of in-state classification. Lawful permanent residents, refugees, asylees, or other eligible noncitizens as defined by federal Title IV regulations may be extended the same consideration as citizens of the United States in determining whether they qualify for in-state classification.

International students who reside in the United States under nonimmigrant status conditioned at least in part upon intent not to abandon a foreign domicile are not eligible for in-state classification.

3. Any student requesting to pay at the in-state tuition rate will be required to provide verification of their lawful presence in the United States in order to be classified as an in-state student or awarded an out-of-state tuition waiver. See Lawful Presence.

VA Compliance Statement

All covered individuals who are accepted and registered for courses in which a certificate of eligibility for entitlement to educational assistance under chapter 31, 33, or 35 has been received or an existing certificate is on file with the Office of the Registrar before the first day of classes for the payment term shall not be cancelled for non-payment, assessed late fees, or denied access to institutional facilities that are provided through mandatory fee payment or specific course registration. This coverage ends on the earlier of the following: date on which payment from VA is made to Georgia Tech, or 90 days after Georgia Tech submits certified tuition and fees following the receipt of the certificate of eligibility.

If the covered individual's eligibility does not cover the entire assessed amount of tuition and fees, the student is responsible for the difference in total tuition and fees and the covered eligibility amount by the posted fee payment deadline.

The first day of classes and fee payment deadline for each term can be found on the academic calendar (https://registrar.gatech.edu/calendar). For information on how to submit a certification of eligibility and other needed documents for processing can be found at https://registrar.gatech.edu/veterans-services.

Verification of Participation

Verification of participation is a process whereby instructional faculty report to the Office of the Registrar and the Office of Scholarships and Financial Aid whether they have students enrolled in their classes who are not engaged with the course.

Verification of participation is a Federal Title IV requirement.The rule requires students who are receiving Federal Title IV financial aid to participate in all courses (credit hours) for which they have been funded. For example if a student is enrolled in twelve credit hours and their financial aid award has been based on a twelve-credit-hour course load, participation must be verified for all twelve credit hours.

Any student who is reported as "not participating" in the courses for which financial aid was awarded will see their amount of aid recalculated and revoked as appropriate. The student will be required to pay back the remaining amount. Lack of participation results in a financial impact for the student. Students cannot accept Federal Title IV aid and then neglect to engage in the study that it is funding.

Participation must be verified for all undergraduate and graduate classes that earn credit, are billable, and are gradable. For example, 7000- and 9000-level thesis courses for graduate students must be reported. Courses that are graded on a Pass/Fail basis must also be reported. Classes that are delivered online or at a distance must be reported.

Participation in a course can be indicated in a variety of ways. As instructional faculty are reporting their findings at the beginning of each term, the following examples might be helpful.

- Attending the class
- Handing in homework
- Taking a quiz or exam
- Posting information or accessing information on a website
- Posting blog entries or comments in a chat room
- Participation in group projects
- Meeting with or communicating with the thesis advisor on research progress
- Any other activity that demonstrates engagement in the course

The tool for reporting the verification of participation is available at https://registrar.gatech.edu/faculty-and-staff/verification-of-participation.

POLICIES

The Rules and Regulations section of this catalog contains detailed information regarding the academic regulations of the Institute. Students who have questions concerning these regulations should consult either their major school or the Registrar's Office.

- Academic Honor Code
- Alcohol and Drug Policy
- Certificate Guidelines
- Disabled Persons Assistance
- Discrimination
- Family Educational Rights and Privacy Act (FERPA) and Applicant Records
- Grading GPA
- Health Policies
- Institute Commitment to Diversity, Equity, and Inclusion
- Intellectual Property Policy
- Required Computer Ownership
- Sexual Misconduct Policy
- Student Absence from Class Due to Illness or Personal Emergencies

Academic Honor Code

The Academic Honor Code is a student initiative that became an official Institute policy in 1996. The objective of the Academic Honor Code is to increase academic integrity and strengthen trust in the Georgia Tech community. All students are required to sign an agreement acknowledging their awareness of the Academic Honor Code. They are strongly encouraged to seek a full understanding of their instructors' expectations regarding academic honor.

The Academic Honor Code is available in the Georgia Tech Policy Library.

Alcohol and Drug Policy

The Student/Student Organization Alcohol Policy is maintained by the Office of Student Integrity and published in the Georgia Tech Policy Library. In the event of any conflict, the most current policy shown on the OSI web site and/or the Policy Library shall govern.

Student/Student Organization Alcohol Policy

Last Revised: August 2015

Review Date: April 2020

Policy Owner: Student Life, Division of Student Engagement & Well-Being

Contact Name: John M. Stein

Contact Title: Associate Vice President for Student Life and Dean of Students

Contact Email: john.stein@studentlife.gatech.edu

The purpose of this policy is to promote and educate about the lawful and responsible use of alcohol by students, and to educate about illegal drugs in order to maintain an environment that is consistent with the educational focus of Georgia Tech.
Georgia Tech will comply with all federal, state, and local laws and policies, including the policies of the Board of Regents of the University System of Georgia, on the abuse of alcohol and other drugs by its students. The legal drinking age in the State of Georgia is 21.

Each member of the Georgia Tech community should be involved in the implementation of, and compliance with this policy. Unless otherwise stated by law, each individual retains responsibility for their actions at all times regardless of their mental state, even if altered by alcohol or other drugs.
Campus organizations may develop and enforce additional group/individual standards which are more restrictive than those established in this policy.

Standards of Conduct and Sanctions

In accordance with federal and state laws and because of the potential detriment to the health and well-being of its students, all students are prohibited from engaging in the unlawful use, possession, manufacture, distribution, dispensation, and sale of alcoholic beverages, controlled substances (including marijuana), and other drugs. The term "dangerous drug" is defined in the Official Code of Georgia Section 16-13-71.

A. **Alcohol**

The sale, distribution, and consumption of alcoholic beverages in or on all Georgia Tech owned or leased (by) property, or on sidewalks/streets are specifically prohibited, with the exception of those approved by the Office of the President or designee. This policy does not prohibit the lawful use of alcohol in Institute-owned residences.

Individual possession and/or consumption of alcohol is acceptable, provided individuals DO NOT:

a. Possess or consume alcohol if under 21 years of age.
b. Furnish, or cause to be furnished, any alcohol to persons under 21 years of age.
c. Conspicuously display open containers of alcohol in any public location, including, but not limited to, grounds, sidewalks, and streets within campus boundaries (but not the public sidewalks and streets, or privately owned or leased property).
d. Sell alcoholic beverages.
e. Misrepresent one's age or identity in any manner for the purpose of obtaining or possessing alcohol.
f. Serve or make available alcohol to intoxicated persons.

Alcoholic beverages may be served and/or consumed by individuals 21 and older at advertised events and activities that are promoted, sponsored, or supervised by a chartered Georgia Tech organization, providing the organization shall:

a. Be responsible for enforcing the entire Student Policy on Alcohol and Illegal Drugs.
b. Completed and confirmed review of the "Acknowledgement of Alcohol and Illegal Drugs Policy." This form will remain on file in the Office of Leadership and Civic Engagement, 2211 Student Center Commons. Acknowledgment of Alcohol and Illegal Drugs Policy Forms are available in the Office of Leadership and Civic Engagement. This must be signed with every officer transition.
c. Ensure that alcohol is not the focal point, the reason for, or the drawing card for an event.

d. Submit, and have approved, a completed Alcohol Event Planning Form. Alcohol Event Planning Forms are available in the Office of Leadership and Civic Engagement.
e. Not advertise the service or availability of alcoholic beverages at functions.
f. Ensure that alcoholic beverages are not consumed by any individual under the legal drinking age of 21.
g. Provide non-alcoholic beverages and food in reasonable quantity, in the same general area, and for the same time period, as the alcoholic beverages are accessible.
h. Control access to the alcoholic beverages through a central point of distribution by a designated server within a designated area at the event (e.g. beer garden) and through the use of sober monitors. Only students who have shown proper proof of age may enter the designated area where alcohol is being served. All alcohol must be distributed and consumed within the designated area. Control is for the purpose of restricting use by those under 21 and/or who are obviously intoxicated.
i. Not use organizational funds to purchase alcohol. Any funds used to pay for alcohol must be taken from personal/private sources and paid to a properly licensed third party vendor. Alcohol may not be paid for by the student organization via a sale at the activity or by charging an admission fee either in advance or at the door (as stated in the Georgia Code of Law, 1981 Section 3-3-21).
j. Not use kegs, champagne/punch fountains, or other common usage containers (such as punch bowls or frozen drink machines) for alcoholic beverages.
k. In the absence of a third-party vendor, designate or hire a TIPS (Training Intervention Procedures for Servers) trained server to monitor the service and consumption of alcohol. It is unlawful to serve or make available alcohol to intoxicated persons (as stated in the Georgia Code of Law, Section 3-3-22).
l. Require a full-time Institute employee, who must not be a minor, to be present for the duration of functions hosted by student organizations where alcohol is served or made available. Advisers are encouraged to attend such functions.

Promotional activities regarding alcohol are as follows:

a. The posted advertisement of alcoholic beverages on campus is not permitted. This includes, but is not limited to: chalking, electronic communications, bulletins, flyers, and social media sites.
b. Campus publications are encouraged to minimize/eliminate all advertisement of alcoholic beverages.
c. No promotion or advertising on campus of incentive drinking ("happy hours", "2-for-1 specials", unlimited quantities of alcohol available at reduced prices or free, events focusing on the consumption of alcohol, etc.) is permitted.
d. Chartered student organizations and student groups may not seek or accept sponsorship or support from companies/vendors whose main focus of business is the manufacture, distribution, or sale of alcohol, other drugs or related paraphernalia.

Participants in Study Abroad programs are bound by the legal drinking age of the respective countries in which they are traveling and in all other respects this policy applies.

Sanctions for Violation of Standards:
Students who violate this policy will be subject to disciplinary action and penalties in accordance with the Georgia Tech Student Code of Conduct.

Attempts to circumvent the provisions in this policy in any way are an infraction of this policy.

B. Possession and/or Use of Illegal Drugs

Georgia Tech does not permit or condone the illegal possession and/or use of controlled substances. Controlled substances means any drug, substance, or immediate precursor included in the definition of controlled substance in the Official Code of Georgia Section 16-13-21 (4) or Schedule I through V of Section 202 of the Federal Controlled Substance Act [21 United States Code 812]. The term "dangerous drug" is defined in the Official Code of Georgia Section 16-13-71.

Sanctions for Violation of Standards:
Any student who violates this policy or any federal or state law or policy regarding the manufacture, distribution, sale, possession, or use of controlled substances or other dangerous drugs shall be subject to disciplinary actions and penalties in accordance with the Georgia Tech Student Code of Conduct.

Additionally, in accordance with Georgia law, any student convicted of a felony that involves the manufacture, distribution, sale, possession, or use of controlled substances or other illegal drug, or chartered student organizations and student groups involved in these activities may be subject to specific penalties required by state law.

Further information regarding the effects of drug abuse and penalties for manufacture, distribution, sale, possession, or use of controlled substances or other illegal drugs is available in the Counseling Center, Stamps Health Services and the Office of the Vice President for Student Life and Dean of Students.

Participants in Study Abroad programs are bound by the policies of the Georgia Institute of Technology regarding the possession and/or use of controlled substances or other illegal drugs.

Drug and Alcohol Counseling, Treatment, and Rehabilitation Programs

Students with alcohol- or drug-related concerns may be referred to, or seek assistance from the Division of Student Affairs. The Division of Student Affairs provides trained professional and paraprofessional counselors in the Counseling Center for drug and alcohol abuse prevention, education, and counseling.

Policy Review

This policy shall be reviewed by a Task Force which includes student representation and is appointed by the Vice President for Student Life and Dean of Students or their designee, to determine its effectiveness, to ensure that policies are enforced and the disciplinary sanctions are consistently applied, to evaluate the effectiveness of the implementation of the educational component of the policy, and to recommend and implement changes as appropriate.

Policy Distribution

The Vice President for Student Life and Dean of Students, or their designee, shall oversee the annual distribution of this Policy to every Georgia Tech student. Additional copies of the Policy on Student Alcohol

and Illegal Drugs may be obtained from the Office of the Vice President for Student Life and Dean of Students.

Parental Notification Policy

Parents or legal guardians of students under the age of 21 may be notified when a student is found responsible for violating the Student/ Student Organization Alcohol Policy when any of the following occur:

- A student endangers himself/herself or others while under the influence of alcohol or other substances. Specific instances include driving under the influence, fighting, alcohol poisoning, and hospitalization.
- When the Vice President for Student Life and Dean of Students determines that any future violation of Institute Policy will most likely result in suspension from Georgia Tech.
- When a student conduct administrator determines that any future violation of Institute policy will likely result in removal from housing.

Certificate Guidelines

- Graduate Certificate Guidelines
- Undergraduate Certificate Guidelines

Graduate Certificate Guidelines

Georgia Institute of Technology offers two types of graduate certificates: **embedded certificates and stand-alone certificates.**

Embedded Graduate Certificates Guidelines

Embedded certificates are intended to encourage students to use the elective requirements in their degree program to form a coherent concentration of coursework in a specified area.

1. Embedded certificates will be granted only to students who, in addition to the certificate program requirements, have satisfied requirements for a graduate degree. The offering unit is responsible for verifying satisfaction of all certificate requirements, as well as completion of a graduate degree. Embedded certificates are not recorded on the student's transcript or diploma. Arrangements must be made for awarding embedded certificates within colleges or offering units. Embedded certificates will not be awarded at the Institute level.
2. All graduate embedded certificate programs must be approved by the Graduate Curriculum Committee and by the Academic Senate.
3. Departments, schools, and colleges are eligible to offer graduate certificate programs in well-defined and coherent subject areas. Certificate programs sponsored jointly by more than one academic unit may be designated as multi-disciplinary certificates, subject to the special requirements listed below.
4. A certificate program generally will be available to all graduate students, subject to the restrictions below. Exceptions must be clearly justified in the certificate proposal.
5. All proposals for a certificate must originate from the faculty of the academic unit offering the certificate or, in the case of a multi-disciplinary certificate, from the faculty of each participating academic unit. Proposals must be endorsed by the appropriate College Dean(s) and by the Provost.
6. In addition to the academic requirements for the certificate, the proposal must define the procedures for management of the program and for awarding certificates. The offering unit must record and maintain enrollment and completion for certificates. The design and working of certificates must be approved by the Provost and a draft must be submitted with the proposal.
7. The embedded certificate program must comprise at least 12 semester hours in a coherent program of which at least three semester hours are foundational to provide a broad overview of that discipline. A multi-disciplinary certificate program will additionally require that courses be taken from more than one academic unit and that at least three semester hours be taken outside the student's major field. Cross-listed courses may be counted as being outside the student's major field.
8. No more than a total of 4 semester hours of Special Problems courses may be included in an embedded certificate program.
9. Courses used in a certificate also may be used to fulfill elective requirements in the student's major degree program.
10. A course may not be counted toward more than one certificate.
11. All courses counting toward the embedded certificate must be taken on a letter-grade basis, and be completed with a grade of B or higher.
12. The availability of a certificate should be noted in the catalog, at least by title, under the appropriate academic unit(s). The academic unit(s) offering the certificate shall publish and make available to students the requirements for the certificate – the courses and total number of hours required, along with the enumeration of any particular courses that are mandated or excluded, and any grade requirements that differ from the general grade requirements of this policy.
13. All certificate programs are to be reviewed during the scheduled academic program review in the sponsoring unit(s).

Georgia Institute of Technology offers two types of graduate certificates: **embedded certificates and stand-alone certificates.**

Stand-Alone Graduate Certificates Guidelines

Stand-alone certificates may be completed independent of students being enrolled as Master's or Doctoral student. These certificates represent a cohesive program of study of a smaller size than a Master's program and provide more flexibility to professionals for pursing graduate education, including a means for professionals to renew and retrain due to a fast-changing work force. When completed, these certificates appear on the student's academic record (transcript), and the student receives a certificate of completion.

Curricular Requirements and Approvals

1. Departments, schools, and colleges are eligible to offer graduate certificate programs in well-defined and coherent subject areas. Certificate programs sponsored jointly by more than one academic unit may be designated as multi-disciplinary certificates, subject to the special requirements listed below.
2. All proposals for a certificate must originate from the faculty of the academic unit offering the certificate or, in the case of a multi-disciplinary certificate, from the faculty of each participating academic unit. Proposals must be endorsed by the appropriate College Dean(s) and by the Provost.
3. All Graduate Certificate programs must be approved by the Institute Graduate Curriculum Committee and by the Academic Faculty Senate.

4. In addition to the academic requirements for the certificate, the proposal must define the procedures for management of the program.
5. The certificate program must comprise at least 12 semester hours in a coherent program of which at least six semester hours are required and the remaining hours may be selected from a set of elective courses. A multi-disciplinary certificate program will additionally require that courses be taken from more than one academic unit. No Special Problems courses may be included in a certificate program.
6. A course may not be counted towards more than one certificate.
7. For students enrolled as a Master's or a Doctoral student, courses used in a certificate also may be used to satisfy requirements in the student's major degree program, unless otherwise designated by the academic unit(s) offering the certificates.
8. All courses counting toward the certificate must be taken on a letter-grade basis, and be completed with a grade of C or higher with a minimum GPA of 2.7 for the certificate.

Admissions

1. Students must be admitted to the Institute as either Graduate Certificate-seeking students or degree-seeking graduate students.
2. Admission requirements for Graduate Certificate-seeking students are listed in the description of the Certificate in the Catalog. A minimum requirement is a Bachelor's Degree.

Completion

1. Certificates will be granted only to students who have satisfied the requirements as listed in the Catalog. Students must complete the certificate requirements within a four-year time-frame.
2. The offering unit is responsible for verifying satisfaction of all Certificate requirements with the final audit being conducted by the Registrar's Office.
3. Upon completion of the required courses, the student must apply for the stand-alone certificate online through the on-line application for graduation. Stand-alone certificates will be awarded three times per year, in May, December, and August. The award of the Certificates coincides with the award of degrees.
4. Award of the Certificate will be posted by the Registrar to the academic record (transcript), and the Registrar's Office will issue a certificate of completion. The design of the certificate of completion will be uniform across the Institute and will be managed in a fashion similar to diplomas.

Management of the Program

1. The availability of a stand-alone certificate should be noted in the Catalog, at least by title, under the appropriate academic unit(s). The academic unit(s) offering the certificate shall publish and make available to students the requirements for the certificate – the courses and total number of hours required, along with the enumeration of any particular courses that are mandated or excluded, any grade requirements that differ from the general grade requirements of this policy, and whether the courses taken for the certificate can be counted towards an MS Degree in that unit.
2. The offering unit must record and maintain data related to student learning and professional opportunities enhanced related to Gainful Employment requirements. Data related to Gainful Employment is required if the Certificate is approved as eligible under Federal Title IV financial aid rules.
3. All certificate programs are to be reviewed during the scheduled academic program review in the sponsoring unit(s).
4. Costs may vary by program

Undergraduate Certificate Guidelines

Certificates are intended to encourage students to use the elective course requirements in their degree program to form a coherent package of coursework in a specified area.

1. Certificates will be granted only to students who, in addition to the certificate program requirements, have satisfied requirements for an undergraduate degree. The offering unit is responsible for verifying satisfaction of all certificate requirements, as well as completion of an undergraduate degree. Certificates are not recorded on the student's transcript or diploma. Arrangements must be made for awarding certificates within colleges or offering units. Certificates will not be awarded at the Institute level.
2. All undergraduate certificate programs must be approved by the Undergraduate Curriculum Committee and by the Academic Senate.
3. Departments, schools, and colleges are eligible to offer undergraduate certificate programs in well-defined and coherent subject areas. Certificate programs sponsored jointly by more than one academic unit may be designated as multi-disciplinary certificates, subject to the special requirements listed below.
4. A certificate program generally will be available to all undergraduate students, subject to the restrictions below. Exceptions must be clearly justified in the certificate proposal.
5. All proposals for a certificate must originate from the faculty of the academic unit offering the certificate or, in the case of a multi-disciplinary certificate, from the faculty of each participating academic unit. Proposals must be endorsed by the appropriate College dean(s) and by the Provost.
6. In addition to the academic requirements for the certificate, the proposal must define the procedures for management of the program and for awarding certificates. The design and wording of certificates must be approved by the Provost and a draft must be submitted with the proposal.
7. A certificate program must comprise at least twelve semester hours in a coherent program, of which at least nine semester hours are upper-division coursework (numbered 3000 or above). A multi-disciplinary certificate program will additionally require that courses be taken from more than one academic unit and that at least three semester hours be taken outside the student's major field. Cross-listed courses may be counted as being outside the student's major field.
8. No more than 6 semester hours of Special Topics courses may be included in a certificate program. No more than a total of 4 semester hours of Special Problems or Undergraduate Research courses may be included in a certificate program.
9. Courses required by name and number in a student's major degree program can not be used in satisfying the course requirements for a certificate.
10. Courses used to satisfy Core Areas A through E in a student's major degree program cannot also be used to satisfy the course requirements for a certificate.
11. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a certificate.

12. All academic units may designate a block/blocks of courses outside of the student's major field of study in which the same course can be used to satisfy the course requirements in the student's major degree program and also be used to satisfy the course requirements for a certificate.
13. A course may not be counted toward more than one certificate and/or minor.
14. All courses counting toward the certificate must be taken on a letter-grade basis, and be completed with a grade of C or better.
15. The availability of a certificate should be noted in the catalog, at least by title, under the appropriate academic unit(s). The academic unit(s) offering the certificate shall publish and make available to students the requirements for the certificate – the courses and total number of hours required, along with the enumeration of any particular courses that are mandated or excluded, and any grade requirements that differ from the general grade requirements of this policy.
16. All certificate programs will be reviewed by the offering academic unit(s) on a regular basis (6 years is recommended) so that decisions can be made about the need for the certificate or the need for it to be revised to meet current academic content.

Disabled Persons Assistance

Assistance for Individuals with Disabilities

The Office of Disability Services provides accessible programs, services, activities, and reasonable accommodations for students with a disability as defined by section 504 of the Rehabilitation Act of 1973, as amended, and by the Americans with Disabilities Act of 1990 and 2008. Services are available to ensure that individuals with disabilities have an equal opportunity to pursue education, employment, or other campus programs, activities, or services.

The Office of Disability Services offers self-identified students with permanent or temporary disabilities assistance with registration, accessibility, transportation, parking, housing, counseling, note taking, recorded textbooks, advocacy, test proctoring, referral services, and other needs. Disability Services promotes disability awareness programs for departmental faculty and staff, as well as the Georgia Tech community.

Students and prospective students who wish to learn more about accommodations for students with disabilities should contact:

Office of Disability Services
Suite 221 Smithgall
Student Services Building
Georgia Institute of Technology
Atlanta, Georgia 30332-0285

call 404.894.2563 (voice) or 404.894.1664 (TTY)
visit http://disabilityservices.gatech.edu
email dsinfo@gatech.edu

Faculty, staff, and visitors should contact:

Disability Services in the Office of Human Resources

404.894.3344 (voice) or 404.894.9411 (TDD)

Office of Disability Services Website

Academic Accommodations for Students with Disabilities

Reasonable accommodations are provided to self-identified students with disabilities who meet the academic and technical standards requisite to admission or participation in the program of study.

Consideration may be given to the substitution or modification of certain course requirements as long as such changes do not detract from the quality of the educational experience and the changes remain within the accreditation criteria for the degree program. Such substitutions or modifications must be approved by the school chair, department head, or college dean, and the Undergraduate Curriculum Committee and/or the Graduate Committee.

Office of Disability Services Website

Discrimination

Equal Opportunity and Non-Discrimination

The Institute does not discriminate against individuals on the basis of race, color, religion, sex, national origin, age, disability, sexual orientation, gender identity, or veteran status in the administration of admissions policies, educational policies, employment policies, or any other Institute governed programs and activities. The Institute's equal opportunity and non-discrimination policy applies to every member of the Institute community.

Family Educational Rights and Privacy Act (FERPA) and Applicant Records

Notification of Student Rights Under FERPA

The Family Educational Rights and Privacy Act (FERPA) affords students certain rights with respect to their education records. They are:

- The Family Educational Rights and Privacy Act (FERPA) affords students certain rights with respect to their education records. They are:
  - The right to inspect and review the student's education records within forty-five days of the day that the Institute receives the request for access.

    Students should submit written requests to the Registrar's office in order to identify the record(s) they wish to inspect. The Registrar will make arrangements for access and notify the student of the time and place where the records may be inspected.

    Students should specify the specific records being requested as stated below when making such written request:

    - Transcripts (Office of the Registrar)
    - Student Disciplinary Records (Office of Student Integrity)
    - Title IX records (Title IX Coordinator)
    - Student Housing (Department of Housing)

- Financial Aid Records (Office of Scholarships and Financial Aid)

For education records that are not specified above, please include a sufficient description and, if possible, the location for the requested records as these records are transient in nature and are not routinely maintained as part of a student's FERPA records.

Please note that fees may be assessed solely to remove other student information that is protected by FERPA and that may be contained within these transient records. You will not be charged to review your student records except as stated herein and we will notify you first if fees may be assessed.

- The right to request the amendment of the student's education records that the student believes are inaccurate or misleading.

  Students may ask the Institute to amend a record that they believe is inaccurate or misleading. They should write the registrar, clearly identifying the part of the record they want changed, and specify why it is inaccurate or misleading.

  If the Institute decides not to amend the record as requested by the student, the Institute will notify the student of the decision and advise the student of their right to a hearing regarding the request for amendment. Additional information regarding the hearing procedures will be provided to the student when notified of the right to a hearing.

- The right to consent to disclosures of personally identifiable information contained in the student's education records, except to the extent that FERPA authorizes disclosure without consent.

  One exception which permits disclosure without consent is disclosure to school officials with legitimate educational interests. A school official is

  - a person whether volunteering for or employed by the Institute in an administrative, supervisory, academic or research, or support staff position (including law enforcement unit personnel and health staff);
  - a person or company with whom the Institute has contracted (such as an attorney, auditor, or collection agent);
  - a person serving on the Board of Regents;
  - a staff member in the office of the Board of Regents;
  - staff in the Office of the Attorney General; or
  - a student serving on an official committee, such as a disciplinary or grievance committee, or assisting another school official in performing their tasks.

  A school official has a legitimate educational interest if the official needs to review an education record in order to fulfill their professional responsibility.

- The right to file a complaint with the United States Department of Education concerning alleged failures by the Georgia Institute of Technology to comply with the requirements of FERPA.

  The name and address of the Office that administers FERPA is:

  Family Policy Compliance Office
  U.S. Department of Education
  400 Maryland Avenue, SW
  Washington, DC 20202-4605

Applicant Records

Access to applicant records is strictly controlled and governed by Institute policy. To the extent permitted by law, these records are treated as confidential.

Annual Notice of Directory Information Contents

"Directory Information" is information not generally considered harmful or an invasion of privacy if disclosed. Effective May 11, 2020, the Georgia Institute of Technology considers the following information to be directory information:

- Name
- Campus mailing address
- Georgia Tech email address
- Level (graduate or undergraduate)
- Field of study (degree, major, minor)
- Enrollment status (full-time, part-time, less than part-time)
- Dates of attendance
- Degrees with associated honors and designations, and date(s) awarded
- Anticipated date of graduation
- Participation in NCAA Division I sports, including terms of team membership

Directory information cannot include social security numbers.

Students who wish to prohibit the release of Directory Information can view information on the registrar's confidentiality Web page.

Georgia Tech's use of information concerning an individual's financial assistance, including information from the Free Application for Financial Aid (FAFSA), is limited and restricted. For more information, see the Office of Scholarships & Financial Aid policy on information sharing.

Possible Federal and State Data Collection and Use

As of January 3, 2012, the U.S. Department of Education's FERPA regulations expand the circumstances under which your education records and personally identifiable information (PII) contained in such records — including your Social Security Number, grades, or other private information — may be accessed without your consent. First, the U.S. Comptroller General, the U.S. Attorney General, the U.S. Secretary of Education, or state and local education authorities ("Federal and State Authorities") may allow access to your records and PII without your consent to any third party designated by a Federal or State Authority to evaluate a federal- or state-supported education program. The evaluation may relate to any program that is "principally engaged in the provision of education," such as early childhood education and job training, as well as any program that is administered by an education agency or institution. Second, Federal and State Authorities may allow access to your education records and PII without your consent to researchers performing certain types of studies, in certain cases even when we object to or do not request such research. Federal and State Authorities must obtain certain use-restriction and data security promises from the entities that they authorize to receive your PII, but the Authorities need not maintain direct control over such entities. In addition, in connection with Statewide Longitudinal Data Systems, State Authorities may collect, compile, permanently retain, and share without your consent PII from your education records, and they may track your participation

in education and other programs by linking such PII to other personal information about you that they obtain from other Federal or State data sources, including workforce development, unemployment insurance, child welfare, juvenile justice, military service, and migrant student records systems.

Additional Information

Additional information on Georgia Tech's FERPA policies is available from the Registrar's Office.

Grading & GPA

- Academic Average
- Auditing
- Final Examinations
- Grade Substitution
- Grading System
- Pass/Fail Grading
- Progress Reports

Academic Average

The "academic average," or grade-point average (GPA), is the ratio of total quality points earned to total credit hours attempted.

When a student passes a course, she/he receives the designated number of credit hours; at the same time, she/he receives a certain number of quality points, based on the letter grade earned. Multiply the number of credit hours designated to the specific course by the numerical value of the letter grade earned to determine the number of quality points earned. Letter grades carry the following numerical values:

- "A" = 4
- "B" = 3
- "C" = 2
- "D" = 1

For example, when a student earns a letter grade of "C" in a 3-credit-hour course, she/he receives 6 quality points.

Grade-point averages are truncated after two decimal places.

A student who repeats a course for which the student has previously received credit (either by class work at the Institute, through AP/IB credit, or credit transferred from another school) forfeits the original credit in the event the student should fail the course on a subsequent attempt. Where a course has been repeated, both the original and subsequent grades are included in the average, but the credit is counted only once. The academic average includes all subsequent attempts, unless a grade substitution request has been approved and processed.

If a student takes the same course more than once, any later grade does not replace any earlier one. The academic average includes both attempts, unless a grade substitution has been approved and processed.

If a student takes a course on a Pass/Fail basis, the course is not included in their academic average.

For undergraduate students, the academic average is calculated by summing the number of quality points earned by the student for all courses in which they have enrolled as an undergraduate and dividing this sum by the number of credit hours designated to all courses in which they have enrolled as an undergraduate.

For graduate students, the academic average includes only the courses in which the student has enrolled after her/his entrance into the graduate division.

Auditing

1. The auditing of a course will be permitted to regularly a enrolled student who has obtained the approval of their advisor and the departments concerned. Such a course counts at full value in computing the student's course load for an academic term.
2. The grade of "V" (i.e., "Visitor") is earned when a student audits a course. The "V" grade has no effect on a student's grade-point average (GPA).
3. No academic credit is granted for auditing a course.
4. Students are not permitted to change to or from an auditing status except through the regular procedures for schedule change or withdrawal. Any student who does not meet the instructor's requirements for a successful audit will be withdrawn with a grade of "W" assigned at the end of the academic term.

Final Examinations

Final Instructional Class Days and Reading Periods

The following applies to the standard academic terms, including the Fall Semester, Spring Semester, and Full Summer Session. It does not apply to the Early Short Summer Session and Late Short Summer Session. Given the variability in the exact timing of the Full Summer Session, the Office of the Registrar will adjust the final instructional class days and reading periods for this semester only in order to meet required instructional time. This policy replaces the former Dead Week (Week Preceding Final Examinations) policy.

1. **Final Instructional Class Days**
    a. Final Instructional Class Days are scheduled during each regular term including the Full Summer Session and are the last two instructional days of the term immediately preceding the first reading period.
    b. No tests or quizzes are to be administered on these days. Lab quizzes and/or practicums may be given in courses comprised of both a lecture and a scheduled lab, wherein the lecture carries at least two credits.
    c. For all courses, graded homework or assignments, lab reports, course projects, demonstrations, studio reviews, and presentations may be due during these two days, provided that they are listed on the syllabus at the start of the semester.
    d. All quizzes and tests should be graded and reported to students on or before the last Final Instructional Class Day.
2. **Reading Periods**
    a. Reading Periods will be designated to provide time for students to prepare for final examinations.
    b. No classes meet. This includes labs, recitations, projects, design/capstone courses, and studios.
    c. No assignments, projects, presentations, or other graded activities are allowed.

   d. Instructors may schedule optional study review sessions for students during reading periods, but no credit or extra credit may be attached to these optional sessions. New content may not be covered, and any materials (e.g., handouts, slides, practice problems, etc.) that are provided at these optional review sessions must be made available to all students. This provision does not require that such optional sessions be audio or video recorded.
3. Requests for exceptions to the Final Instructional Class Day and Reading Period policies may be made in writing by the Dean of the College (or their designee) to the Student Rules and Regulations Committee (SRR). The SRR will then make a recommendation to the Undergraduate Institute Curriculum Committee or Graduate Institute Curriculum Committee, as appropriate, for approval or denial. Requests must be made no later than the academic term prior to the desired term of implementation and will be regularly reviewed.
4. Student concerns may be discussed with the faculty member and/or reported to the Chief Academic Officer of the department of instruction, or with the Assistant Provost for Academic Advocacy and Conflict Resolution. For more information, see the Student Academic Grievance Policy.

Final Examinations

1. In all courses of the Institute offered for a letter grade, a final assessment, either a final examination or some alternative form, shall be administered. The decision on the type of final assessment shall be made by the instructor of record, and an announcement of the course's final assessment policy shall be made to the class by the end of the first week of the term (close of Phase II registration) and included in the course syllabus.
2. A change to a class's type of final assessment after the close of Phase II registration must be announced to all students in the class before the last day to withdraw from a single class.
3. In regularly scheduled, full-semester courses of the Institute, final examinations shall be scheduled during the Final Examination Period at the time specified in the official Final Examination Schedule as distributed by the Office of the Registrar, and meeting times for alternative final assessments shall not be scheduled during the Final Examination Period at any time other than the time specified in the official Final Examination Schedule.
4. No assessment other than a final examination or an alternative final assessment may be due during the Final Examination Period.
5. Requests to change a class's final examination time within the Final Examination Period must be submitted to the Chief Academic Officer of the department of instruction for approval no later than one week before the beginning of the Final Examination Period. Any such request must have the unanimous approval of the class as shown by secret ballot, as well as approval by the instructor of the class.
6. A change in the scheduling of a final assessment during the Final Examination Period for an individual student ordinarily will not be permitted; however, such a change may be allowed for hardship cases at the discretion of the instructor. The request for a change must be justified in writing by the student and shall be submitted to the instructor prior to Final Examination Period and may be rescheduled to an appropriate time.
7. In the event a student has two final assessments scheduled for the same time, the course having the lower number shall be considered in conflict and the student shall notify the instructor no later than two weeks before the first day of the Final Examination Period. In such case, the final assessment in that course shall be given during the Conflict Examination Period or, by agreement of the instructor and the student, at a mutually satisfactory time.
   a. If the student notifies the instructor after the above deadline but before the first day of the Final Examination Period, the student shall, at the discretion of the instructor:
      i. receive a course grade of "I" (Incomplete), with an opportunity to take a makeup final examination the following academic term (and have the course grade changed as warranted by the results of the test), or
      ii. be given the final assessment during the Conflict Examination Period or at an alternative time during the Final Examination Period.
   b. A student who fails to notify the instructor of the conflict before the first day of the Final Examination Period shall, at the discretion of the instructor:
      i. receive a score of zero on the final assessment, or
      ii. be given the final assessment during the Conflict Examination Period or at an alternative time during the Final Examination Period.
8. In the event a student is scheduled for three final assessments in one day, the assessment scheduled for the middle period shall be considered in conflict and the student shall notify the instructor no later than two weeks before the first day of the Final Examination Period. In such case, the final assessment in that course shall be given during the Conflict Examination Period or, by agreement of the instructor and the student, at a mutually satisfactory time.
   a. If the student notifies the instructor after the above deadline but before the first day of the Final Examination Period, the student shall, at the discretion of the instructor:
      i. receive a course grade of "I" (Incomplete), with an opportunity to take a makeup final assessment the following academic term (and have the course grade changed as warranted by the results of the test), or
      ii. be given the final assessment during the Conflict Examination Period or at an alternative time during the Final Examination Period, or
      iii. be given the final assessment at the time scheduled for the course.
   b. A student who fails to notify the instructor of the conflict before the first day of the Final Examination Period shall, at the discretion of the instructor:
      i. receive a score of zero on the final assessment, or
      ii. be given the final assessment during the Conflict Examination Period or at an alternative time during the Final Examination Period, or
      iii. be given the final assessment at the time scheduled for the course.
9. At the discretion of the instructor, students who arrive late, who exit the room without permission, or who are absent for an excessive period of time may forfeit their opportunity to complete the final assessment.
10. Students will have the full two hours and fifty minutes to complete the final, unless otherwise stated on the syllabus. Students must be notified in writing of any changes to the duration of the final exam before the withdrawal deadline.

Grade Substitution

A. Grade Substitution for Undergraduate Students

Undergraduate students may repeat courses for grade substitution according to the following set of criteria. If these conditions are not met, the general policy governing repeated courses applies.

1. Undergraduate students may repeat for grade substitution up to two GT courses with posted letter grades of D or F. These courses will be excluded from calculation of their cumulative grade point average.
2. A course can be taken for grade substitution only once and must be repeated within one calendar year. Students who completed the Georgia Tech course prior to matriculating as first-year, degree-seeking undergraduates (e.g., joint/dual enrollment or in a non-degree seeking status) have one calendar year from their matriculation date to repeat the course.
3. A course is not eligible for grade substitution if the student was found responsible for any academic misconduct in that course regardless of how many times it is repeated.
4. Grades excluded under previous Institute rules (such as the Grade Substitution policy that was in effect up until 2019) count toward the maximum two courses allowed for substitution.
5. Once a grade substitution is posted, the student cannot remove the exclusion or change it to another course at a later date. A student cannot request a grade substitution after they have graduated.
6. The application for grade substitution must be filed with the Registrar's Office no later than the deadline for withdrawing from a course during the student's next term of enrollment after the course is repeated.
7. Students should not submit the form during the term they are repeating the course.

The original grade and the repeated grades will all appear on the official transcript. Once a grade substitution is applied to a course, the credit hours attempted and earned on the course will be removed from the calculation of the cumulative grade point. Excluded courses and hours will continue to be counted in calculations of satisfactory progress, for financial aid eligibility, and for tuition.

Students should be aware that many graduate and professional schools recalculate grade point averages in the process of considering an applicant for admission to such programs. This recalculation may include restoring the grades of the repeated classes and their effects on the cumulative grade point average.

The grade substitution policy (including, but not limited to, course eligibility, number of courses, time limits, and deadlines) is not subject to exceptions and *may not* be petitioned to the Undergraduate Institute Curriculum Committee.

Download Form

Frequently Asked Questions about the Undergraduate Grade Substitution Policy

B. Grade Substitution for Graduate Students

Graduate students may repeat a course for grade substitution according to the following set of criteria. If these conditions are not met, the general policy governing repeated courses applies.

1. Graduate students may repeat for grade substitution one GT course with posted letter grades of C, D or F. The course will be excluded from calculation of their cumulative grade point average.
2. The one-substitution limit holds during the entirety of their time as a graduate student regardless of the number of degree programs that they might enroll in.
3. A course can be taken for grade substitution only once. Since not all graduate-level courses are offered each term, the student should consult with their academic advisor about planning to retake the course. Due to course scheduling constraints, some courses may not be repeatable in a timely fashion. This assumes the course is offered again in a future term.
4. A course is not eligible for grade substitution if the student was found responsible for any academic misconduct in that course regardless of how many times it is repeated.
5. Once a grade substitution is posted, the student cannot remove the exclusion or change it to another course at a later date. A student cannot request a grade substitution after they have graduated.
6. The application for grade substitution must be filed with the Registrar's Office no later than the deadline for withdrawing from a course during the student's next term of enrollment after the course is repeated.
7. Students cannot submit the form until after the course is repeated.
8. The original grade and the repeated grade will all appear on the official transcript. Once a grade substitution is applied to a course, the credit hours attempted and earned on the course will be removed from the calculation of the cumulative grade point. The excluded course and hours will continue to be counted in calculations of satisfactory progress, for financial aid eligibility, and for tuition.
9. This policy cannot be used to extend the applicable dates of an I-20 or other type of visa.

The grade substitution policy (including, but not limited to, course eligibility, time limit, and deadline) is not subject to exceptions and *may not* be petitioned to the Institute Graduate Curriculum Committee.

Download Form

Applying for Graduate Grade Substitution

Grading System

Grades

The letter grades used in the calculation of grade-point average (GPA) are as follows:

A	Excellent. Four quality points.
B	Good. Three quality points.
C	Satisfactory. Two quality points.
D	Passing. One quality point.

F	Failure. No quality points. If the course is required, the student must repeat it.

Guiding principles for the determination of grades:

- The grading system an instructor uses, including relative weighting of different types of grading instruments (e.g., _% for homework, _ % for quizzes) must be communicated to students in the course syllabus and aligned with the course objectives, teaching activities, assignments, and assessments. For guidance on specific approaches to grading, see the Center for Teaching and Learning website (https://ctl.gatech.edu/grading-and-assessment-resources).
- Students should be able to easily translate their scores on assignments to their course letter grade. The criteria for final grades should be clearly indicated on the syllabus. For example, A grade of “A” corresponds to a percentage grade of __% or above on graded assignments, a grade of “B” corresponds to a percentage grade of __ %-__% , etc.
- Students must be graded against a set of standards, not solely on their performance relative to their classmates.
- The grading process and scoring methods should be clear and provide students with meaningful feedback throughout the term, allowing students to reasonably predict progress towards their final grade as the semester advances.
- It is the responsibility of the instructor to design assignments and scoring criteria that are consistent with the published grading scheme. Grade adjustments may be made to increase, not lower, students' grades.

The following grades are used under special conditions and are not included in the calculation of grade-point average (GPA):

S	Satisfactory
U	Unsatisfactory
V	No credit earned. The "V" grade is used when a student audits a course.

The following grades are used in the cases indicated and are not be included in the calculation of grade-point average (GPA):

I	Incomplete. The "I" grade is used when, for reasons beyond her/his control and deemed acceptable by the instructor, a student whose academic performance had been satisfactory becomes unable to fulfill a course's requirements. If the student's academic performance had been so poor as to preclude her/his passing, the instructor shall assign the grade of "F." Regulation VII., "Deficiencies," outlines the removal of the "I" grade. See the Registrar's Office website for more guidance on the use of the Incomplete grade under Incomplete grade page under the Faculty section.
W	Withdrawal without Penalty. Withdrawals from individual courses without penalty are not permitted after 60 percent of the academic term has passed, as specified by the official Academic Calendar, except in cases of hardship, as determined by the Undergraduate Institute Curriculum Committee or Graduate Institute Curriculum Committee, as appropriate. Withdrawal from the Institute is not permitted after 60 percent of the academic term has passed, except in cases of hardship, as determined by the Undergraduate Institute Curriculum Committee or Graduate Institute Curriculum Committee, as appropriate. With the exception of part-time graduate students, those who withdraw from the Institute and receive all grades of "W" customarily will not be permitted to enroll in courses in the next succeeding academic term. Regulation VII., "Withdrawal and Readmission," outlines the Institue's policies on readmission. Faculty are expected to return to students a graded assignment or other meaningful performance feedback prior to the deadline for withdrawing from classes so that students can make informed decisions about withdrawing.
NR	Not Reported. The "NR" grade is used when, by no fault of the student, the instructors fails to submit grades before the deadline.
IJ	Incomplete Judicial. The “IJ” is used when academic misconduct has been reported in a class and the investigation is being conducted. It is a placeholder grade that is changed to a permanent grade as determined by the outcome of the investigation. It remains in place until the charges are adjudicated and a proper final grade is determined and assigned.

- Final grades are reported to the Office of the Registrar at the end of each academic term.
- Progress report grades are submitted to the Office of the Registrar for all classes numbered 1000 and 2000 in the Fall Semester and Spring Semester. These grades are used for advising students, not for calculating any grade-point average (GPA) at Georgia Tech. Progress report grades are "S" or "U." A grade of "U" indicates that, based on the work completed to that point in the academic term, the student's standing is in the "D" or lower range. Progress report grades must

be submitted once 40 percent of the academic term has passed, as specified by the official Academic Calendar. The due date for reporting will be noon on Monday and the grades will be available to students that afternoon.

- If a final course grade is believed to be erroneous, the student should contact the professor as soon as possible. In general, no change of grade will be made after the end of the student's next academic term in residence.

Academic Average

The "academic average," or grade-point average (GPA), is the ratio of total quality points earned to total credit hours attempted.

When a student passes a course, she/he receives the designated number of credit hours; at the same time, she/he receives a certain number of quality points, based on the letter grade earned. Multiply the number of credit hours designated to the specific course by the numerical value of the letter grade earned to determine the number of quality points earned. Letter grades carry the following numerical values:

- "A" = 4
- "B" = 3
- "C" = 2
- "D" = 1

For example, when a student earns a letter grade of "C" in a 3-credit-hour course, she/he receives 6 quality points.

Grade-point averages are truncated after two decimal places.

A student who repeats a course for which the student has previously received credit (either by class work at the Institute, through AP/IB credit, or credit transferred from another school) forfeits the original credit in the event the student should fail the course on a subsequent attempt. Where a course has been repeated, both the original and subsequent grades are included in the average, but the credit is counted only once. The academic average includes all subsequent attempts, unless a grade substitution request has been approved and processed.

If a student takes the same course more than once, any later grade does not replace any earlier one. The academic average includes both attempts, unless a grade substitution has been approved and processed.

If a student takes a course on a Pass/Fail basis, the course is not included in their academic average.

For undergraduate students, the academic average is calculated by summing the number of quality points earned by the student for all courses in which they have enrolled as an undergraduate and dividing this sum by the number of credit hours designated to all courses in which they have enrolled as an undergraduate.

For graduate students, the academic average includes only the courses in which the student has enrolled after her/his entrance into the graduate division.

Pass/Fail Grading

A. General

1. At the option of the student's major school, credit toward a bachelor's degree may be allowed for courses taken under the pass/fail system and completed with a grade of "Pass."
2. The major school must approve all pass/fail courses included in the final program of study, and students should be aware of school requirements.
3. In graduate programs, thesis research hours will be evaluated on a pass/fail basis.
4. Pass/fail enrollment in any course may be restricted by the school or department offering the course.
5. Students who are permitted to register under the pass/fail system will be so designated on the official class rolls. The grades recorded will be "S" for "Satisfactory" or "U" for "Unsatisfactory." These grades will not be included in the calculation of the grade-point average and cannot be changed to a grade that will count in the average.
6. Withdrawals from courses taken on a pass/fail basis will follow the same rules that govern withdrawals from courses included in the grade-point average.
7. The deadline to change the grade mode from letter grade to pass/fail (and vice versa) is the same day as the Last Day to Withdraw from Individual Courses without a Penalty.

Grade mode changes are allowed online during the Registration Period. After the Registration Period ends, the following form must be completed and submitted to the Office of the Registrar.

Download Form

B. Credit Hours Permitted

1. The maximum number of credit hours that a student may earn on a pass/fail basis is related to the number of credit hours required for the program of study in which the student is enrolled.

Hours included in program of study	Hours allowed on pass/fail basis
45 to 70 credit hours	3 credit hours
71 to 90 credit hours	6 credit hours
91 or more credit hours	9 credit hours

2. For a second undergraduate degree, these limits apply to the credit hours included in the program of study for that second degree.
3. A master's degree program of study may include up to three semester credit hours on a pass/fail basis.

Progress Reports

Progress Report grades of "S" or "U" are issued for all students enrolled in 1000 and 2000 level courses in the Fall Semester and Spring Semester prior to midterm, a Progress Report grade of "U" indicates a performance level of "D" or lower. These are not permanent grades and never appear on a transcript, but are issued to help students assess where they stand in the class and obtain academic help from the faculty and the many academic resource services available on campus.

For more information, see Regulation V., "Grades/Average," Section A, "Grades."

Health Policies

A Medical Entrance Form and proof of required immunizations and tuberculosis screening must be on file with Stamps Health Services. Failure to provide this information may result in a health hold and delay of registration. All international students (F1 and J1 visas) are required to have health insurance coverage. Students may elect to purchase the health insurance made available by the health insurance provider contracted by Georgia Tech or may have their own comparable medical insurance.

Student Health Insurance

Source: Stamps Health Services

The Georgia Board of Regents (BOR) offers student health insurance for eligible students and their dependent(s). Two groups of students may purchase student health insurance: Mandatory and Voluntary. Mandatory students are required by the BOR to have student health insurance and the charge is applied automatically to the student's account along with tuition. Mandatory Graduates: Teaching Assistant, F1 or J1 visa holder, Research Assistant, Fellowship or Full tuition waiver. Mandatory Undergraduates: F1 or J1 visa holders. Mandatory students who already have health insurance may apply to waive the Board of Regents (BOR) student health insurance coverage.

There is a 30 day open enrollment period at the start of each semester to enroll for student insurance coverage, to enroll for the voluntary plan, or for mandatory students to add spouse/dependents coverage. For students and spouses with Board of Regents (BOR) student health insurance, Stamps Health Services (SHS) is the primary care provider. SHS renders care to students, spouses, and domestic partners. Dependent children are not eligible to be treated at SHS.

More information is available at www.health.gatech.edu

Immunizations

Source: Stamps Health Services

All incoming students must comply with the Board of Regents of the University System of Georgia's immunization requirements. It is strongly recommended that immunization requirements are met as soon as possible to avoid a registration hold. A registration hold keeps students from registering for classes

Incoming students must use Stamps Health Services Immunizations Form.

More information is available at www.health.gatech.edu

Special Health Considerations

Source: Georgia Tech Policy Library

It is the responsibility of all students to notify the Health Center, the School of Applied Physiology, and the Office of Disabled Student Services of any disability that would make participation in swimming, competitive sports, and aerobic training hazardous to their well-being. Any student requesting special consideration because of mental or physical disability should have their physician write an explanatory letter, giving full details of the disability and consequent limitations on physical activity, to the medical director of Health Services. This letter must accompany the Medical Entrance Form.

Institute Commitment to Diversity, Equity, and Inclusion

Diversity is one of Georgia Tech's greatest strengths and one of the major priorities identified in our twenty-five-year strategic plan.

> *"We will recruit, develop, retain, and engage a diverse cadre of students, faculty, and staff with a wide variety of background, perspectives, interests, and talents, creating a campus community that exemplifies the best in all of us—in our intellectual pursuits, our diversity of thought, our personal integrity, and our inclusive excellence."* — Georgia Tech Strategic Plan

At Tech, we embrace and leverage diversity in all its manifestations. We are proud that we are one of the most diverse universities in the world with students who represent every state in the nation and more than 100 countries. In the years ahead, our goal is to continue to build a campus culture of collegiality, close collaboration, global perspective, intercultural sensitivity, respect, and thoughtful interaction among a diverse community of students, employees, and alumni.

We realize that, in order to achieve our vision for Georgia Tech as a leader in influencing the major technological, social, and policy decisions in the twenty-first century, we must recruit and retain faculty, staff, and students from a wide array of backgrounds, perspectives, interests, and talents. In doing so, we will create a community that exemplifies the best in all of us – our intellectual pursuits, our diversity of thought, and our personal integrity. Our mission to achieve inclusive excellence means unleashing the full potential of Tech's human capacity to create a better, sustainable future for us all.

You are invited to join us on the journey of creating and sustaining a future that builds upon the talents of all members of our community in addressing the major challenges of this and future generations.

The Office of the President
Georgia Institute of Technology

Intellectual Property Policy

The Georgia Institute of Technology is dedicated to teaching, research, and the extension of knowledge to the public. Its personnel recognize as two of their major objectives, the production of new knowledge and the dissemination of both old and new knowledge. Inherent in these objectives is the need to encourage the development of new and useful devices and processes, the publication of scholarly works and educational materials, the development of computer software, and other forms of Intellectual Property.

The Institute's Intellectual Property Policy, concerning inventions, copyright, and computer software, **applies to students** as well as to faculty and staff. Adherence thereto is a condition of continued enrollment at the Institute.

All full or part-time faculty and staff shall, as a condition of employment with the Institute, execute an agreement, assigning all rights, title, and interest, to the extent prescribed in this policy, in any Intellectual Property to the Georgia Tech Research Corporation.

Students shall be required to execute an agreement:

1. When working on a research project funded by an entity other than Georgia Institute of Technology, the Georgia Tech Foundation, or the Board of Regents;

2. When employed by Georgia Institute of Technology; or
3. When required by the Office of the Provost. Such requirement may be recommended by a faculty member who has students working in faculty-directed research.

For more information and the full text from the Institute's Intellectual Property policies, visit Georgia Tech's online Policy Library and the Faculty Handbook.

Georgia Tech Policy Library: Intellectual Property

Faculty Handbook

Office of Technology Licensing and Georgia Tech's Online Invention Disclosure System

Georgia Tech Research Corporation

Required Computer Ownership

In an effort to foster equal access to computers and to make the most of the teaching and learning technology available at Georgia Tech, all undergraduate students entering Georgia Tech under this or subsequent catalogs are required to own or lease a computer. The minimum hardware and software requirements (as well as purchasing and financing options) are sent each spring to students accepted for the summer and fall semesters, and in the fall to students accepted for spring semester.

Because computer ownership is mandatory, an average cost for the minimum hardware and software required can be included in computing a new student's cost of education for the purpose of determining their eligibility for all forms of student financial aid. Students should contact the Office of Scholarships and Financial Aid for more information.

Student Computer Ownership Website

Sexual Misconduct Policy

The official and most current version of the Sexual Misconduct Policy is available in the Georgia Tech Policy Library.

Sexual Misconduct Policy

Student Absence from Class Due to Illness or Personal Emergencies

Expectations, Rights, and Responsibilities

A. A student may miss class on occasion due to medical issues. The following statement intends to describe the expectations, rights, and responsibilities of all involved including students, Office of Student Life, instructors, and health care providers. The information is intended to give students better direction as to how they should proceed to notify instructors when they are ill and need to miss class and what kind of documentation they should provide and to whom. The information is intended to provide faculty, instructors, information that will be more useful to them in determining the student's options for making up the work, or understanding the implications on their grade in the class. The information is intended to provide some guidance to the on-campus health services staff and off-campus health care providers in terms of what kinds of documentation is needed and how it will be handled once provided.

1. **Students: Expectations, Rights, and Responsibilities**

Students who need to miss class due to illness should be aware of the following:

a. If ill, and possibly contagious, students are expected to take appropriate action including not coming to class and seeking medical treatment.
b. Students have the right to expect that their privacy will be protected under HIPAA but they must follow proper procedures in order to ensure that health care information is kept private.
c. Students are responsible for seeking medical attention and for obtaining some type of documentation that would include the following minimal information:
    i. Date of the visit
    ii. Name of medical facility where treatment occurred
    iii. Diagnosis or indication of whether class absence is recommended or required
    iv. Expected duration of the recovery
d. Students are responsible for providing the documentation to the Office of Student Life where it will be treated and handled confidentially with necessary information being submitted to the student's instructors for that term.

2. **Office of Student Life: Expectations, Rights, and Responsibilities**

In regard to supporting students who need to miss class due to illness the Office of Student Life is expected to remain aware of the following:

a. It will serve as the collection point for medical documentation and treat it in a confidential manner.
b. It will share the medical documentation with appropriate instructional faculty. Sufficient information from the medical documentation to ensure that the dates of illness or of treatment for the illness occurred will be shared with the instructional faculty.
c. It will share sufficient information as to help determine whether the illness was of sufficient concern that missing class was recommended or required.
d. It will answer questions that instructional faculty may have if they are unclear about what to do with the information.

3. **Instructors of Classes: Expectations, Rights, and Responsibilities**

In regard to supporting students who need to miss class due to illness, instructors are expected to remain aware of the following:

a. It is the responsibility of the instructors to respect the student's right to confidentiality and understand that medical documentation will be handled by the Office of Student Life in an appropriate manner.
b. It is expected that instructors will not ask the student directly for medical documentation. If it is

provided without being requested, the instructors should return it to the student or destroy it.

c. Instructors are expected to:
   i. Work with the student to make up the missed assignments, when possible.
   ii. Work with the student to find alternatives, if possible, if the assignments missed cannot be made up.
   iii. Do so within a reasonable timeframe.

4. **Medical Professionals: Expectations, Rights, and Responsibilities**

In regard to supporting students who need to miss class due to illness, medical professionals are expected to remain aware of the following:

a. At the request of the student (patient), it is expected that some type of document be provided that indicates at minimum the date of the visit or treatment. If the student is to miss class, it is expected that the student would have sufficient information from the medical facility to support that need.
b. It is expected that the medical professional will provide sufficient information to the student so that the student can then provide it to the Office of Student Life.
c. The medical professional can expect the information to be handled in a confidential manner.
d. The medical documentation must be on official letterhead of the facility and contain a date.

B. A student may miss class on occasion due to personal emergencies. Whatever the type of personal that exists, there are expectations on part of the students, the Office of Student Life, and the instructional faculty.

1. **Students: Expectations, Rights, and Responsibilities**

Students who need to miss class due to personal emergencies should remain aware of the following:

a. Some type of documentation is required by the Office of Student Life. This could take the form of an obituary, travel itinerary, or other type of document that would include a date and possibly some type of explanation for the absence.
b. The length of the absence needs to be clear as part of the documentation.
c. Student have the right to expect that their privacy will be protected under FERPA.

2. **Office of Student Life: Expectations, Rights, and Responsibilities**

In regard to supporting students who need to miss class due to personal emergencies the Office of Student Life will remain aware of the following:

a. It will serve as the collection point for documentation and treat it in a confidential manner.
b. It will share with appropriate instructors sufficient information from the documentation to ensure that the dates of the incident or event are clear and that it was a severe enough life interruption to cause absence from class.
c. It will answer questions that instructional faculty may have if they are unclear about what to do with the information.

3. **Faculty/Instructors of Classes: Expectations, Rights, and Responsibilities**

In regard to supporting students who need to miss class due to personal emergencies, instructors are expected to remain aware of the following:

a. It is the responsibility of the instructors to respect the student's right to confidentiality and understand that the documentation will be handled by the Office of Student Life in an appropriate manner.
b. It is expected that instructors will not ask the student directly for documentation. If it is provided without being requested, the instructors should return it to the student or destroy it. Depending upon the kind of documentation it is, there could be other information in it that could compromise the privacy of others, including other family members.
c. Instructors are expected to:
   i. Work with the student to make up the missed assignments, when possible.
   ii. Work with the student to find alternatives, if possible, if the assignments missed cannot be made up.
   iii. Do so within a reasonable timeframe.

Forms:

- Application to Request a Leave of Absence
- Application to Request to Return from a Leave of Absence

RULES AND REGULATIONS

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I. Purpose

These regulations are intended to set forth the requirements of the faculty to the end that a large student body may live and work together harmoniously with a minimum of friction and misunderstanding. Each student is expected to be a law-abiding citizen and to obey the laws of the city of Atlanta, Fulton County, the state of Georgia, and the United States.

II. Academic Calendar

A. Standard Calendar

Georgia Tech's standard Academic Calendar consists of a Fall Semester, a Spring Semester, and an accelerated Summer Session. Each Fall Semester and each Spring Semester normally includes approximately fifteen weeks of instruction plus one week of final examinations. A normal Summer Session includes approximately eleven weeks of instruction plus one week of final examinations. Each Academic Year consists of one sequence of a Fall Semester followed by a Spring Semester. The word "term" may refer to a Fall Semester, a Spring Semester, or a Summer Session. The Office of the Registrar publishes the official Academic Calendar for each term. Due to variations in the yearly calendar and the need to balance the dates of campus events, particularly in the Fall Semester, the Registrar uses discretion, as appropriate, to set dates on the Academic Calendar, such as Fall Recess, the Last Day to Withdraw from Individual Courses without a Penalty, and the Progress Report Grade Due Date. See Catalog Regulation V. Grades and Scholastic Average for more information.

B. Other Academic Terms

In addition to the standard Academic Calendar, some programs may be offered on other schedules. All such offerings are subject to the approval of the Institute Undergraduate Curriculum Committee, Institute Graduate Committee, and/or the Registrar, as appropriate. With approval, such programs may operate under different academic rules, such as credit hour limits or withdrawal dates, than those specified for standard academic terms.

C. Curriculum Year

1. Requirements for degrees and minors shall be specified for each Curriculum Year, which is comprised of a Summer Session plus the immediately following Fall Semester and Spring Semester. This designation shall be independent of any schedule for publication of such requirements in printed or electronic form.
2. All changes in degree and minor requirements shall become effective at the beginning of the next Curriculum Year following final approval by the Institute Undergraduate Curriculum Committee, Institute Graduate Committee, Academic Senate, and/or University System, as appropriate.
3. The Office of the Registrar shall maintain an archival record of all degree and minor requirements associated with each curriculum year.

D. Unit of Credit Defined

The current Academic Calendar is semester#based, consisting of 15 weeks of instruction in a standard Fall/Spring semester where one contact hour is equal to 50 minutes of instruction. The amount of class attendance is 750 minutes for each scheduled credit hour in a standard semester.

One unit of credit represents how much time a typical student is expected to devote to learning in a typical week of study. Each unit of credit is representative of in#seat effort and out#of#seat effort. One credit awarded yields a total of 3 contact hours of effort on the student's behalf. The breakdown of effort from in#seat effort (scheduled time) vs. out#of#seat effort (non#scheduled time) differs by course structure and schedule type.

For scheduled time, one 15#minute instructional break per 75 minutes of continuous instruction will be included for courses meeting in durations of greater than 75 continuous minutes.

This policy is consistent with specifications in the University System of Georgia Academic and Student Affairs Handbook, Section 2.1 Semester System, Uniform Academic Calendar, Cancellation of Classes and Religious Holidays. The policy is also consistent with the Southern Association of Colleges and Schools policy statement on credit hours.

The amount of time that students should expect to spend in#seat (scheduled time) and out#of#seat (nonscheduled time) should be commensurate with catalog structure of the course as approved by the Institute Undergraduate Curriculum Committee and/or the Institute Graduate Curriculum Committee. The appropriate committee must approve exceptions to this policy.

At Georgia Tech, courses have historically been classified as 'lecture' with a 1:1 ratio and/or 'laboratory' with a 3:1 ratio. These labels have become increasingly inconsistent with the creation of new scheduling types as faculty introduce new pedagogies in the classroom. The list below offers flexibility in how the Institution refers to the in#seat/out#of#seat efforts for existing and new scheduling types.

Effort 1 (Lecture)

"Lecture" based courses yield a 1:1 ratio of in#seat effort to credit hours. This means that for every 1 credit hour of lecture, there is 1 scheduled contact hour and an expectation for 2 contact hours of nonscheduled effort.

Effort 2 (Studio)

"Studio" based courses yield a 2:1 ratio of in#seat effort to credit hours. This means that for every 1 credit hour of studio, there are 2 scheduled contact hours and an expectation for 1 contact hour of nonscheduled effort.

Effort 3 (Laboratory)

"Laboratory" based courses yield a 3:1 ratio of effort to credit hours. There are three types in Banner; Supervised, Unsupervised, and Mixed.

- "Supervised Laboratory" means that for every 1 credit hour of supervised laboratory, there are 3 scheduled contact hours and an expectation for no non#scheduled effort besides the completion of a post#laboratory report.
- "Unsupervised Laboratory" means that for every 1 credit hour of unsupervised laboratory, there are 3 non#scheduled contact hours and an expectation for no scheduled effort.
- "Mixed Laboratory" means that for laboratories worth 2 credits or more in even increments (ie: 2, 4, 6, credit hours, etc.), that half of the total credit hours are treated as supervised laboratories and half are treated as unsupervised laboratories. Breakdown in whole credits only.

III. Notices

A. Notices

All enrolled students have an e-mail account provided by Georgia Tech. This account is a student's official point of contact with the Institute, and she/he is expected to check it each school day. Students are also expected to be aware of notices that appear on the Student Access System and of general notices that are in the *Technique*. It is the student's responsibility to check the Student Access System, both during the Drop/Add Period and during the academic term, in order to verify the accuracy of their course schedule and to become aware of important notices. A student should verify their course schedule at least once during the first five weeks of the academic term and once after Mid-term.

B. Change of Address

When a student's address changes, the student is responsible for updating their record in the Student Access System within one week of the change.

C. Unclaimed Mail

Students are responsible for returning to the front window of the Post Office all mail in their Post Office boxes that is unclaimed after three days.

D. Physical Location of Students

To comply with federal regulations, the Higher Education Act, the Georgia Institute of Technology must confirm where our students are physically located while enrolled. In an effort to capture this information, a hold will be placed in the registration system during registration periods. Students are responsible for updating this information when it changes.

More information is on the Office of the Registrar website at: https://registrar.gatech.edu/info/common-registration-error-messages.

IV. Attendance

A. General

1. Each term, a course listing is published showing the time period for each class.
2. If an instructor should be late in meeting the class, the students shall wait twenty minutes after the published starting time. If the instructor has not arrived by that time, the students may leave unless specifically notified to await the instructor's arrival.

B. Class Attendance

1. There are no formal institutional requirements regarding class attendance at Georgia Tech. The resources of the Institute are provided for the intellectual growth and development of the students who attend. A schedule of courses is provided for the students and faculty to facilitate an orderly arrangement of the program of instruction. The fact that classes are scheduled is evidence that attendance is important; students should, therefore, maintain regular attendance if they are to attain maximum success in the pursuit of their studies.
2. All students are responsible for obtaining an understanding of each instructor's policy regarding absences; all students are expected to attend announced quizzes, laboratory periods, and final examinations. Although it is recognized that occasionally it may be necessary for students to be absent from scheduled classes or laboratories for personal reasons, students are responsible for all material covered in their absences, and they are responsible for the academic consequences of their absences. Students should discuss planned absences with their instructors as soon as possible after the beginning of an academic term. Work missed may be made up at the discretion of the instructors.
3. In the event of a medical emergency or an illness that is severe enough to require medical attention, students are responsible for contacting the Office of the Dean of Students as soon as possible to report the medical issue or emergency, providing dated documentation from a medical professional and requesting assistance in notifying their instructors. The medical documentation will be handled confidentially within the Office of the Dean of Students and will inform a decision as to whether communication with instructional faculty is appropriate. It is the expectation of the Institute that instructional faculty will honor a request from the Office of the Dean of Students to excuse a medical emergency or illness and allow make-up of the work missed, including homeworks, quizzes, presentations, examinations, or other class assignments.
4. Students who are absent because of participation in approved Institute activities (such as field trips, professional conferences, and athletic events) will be permitted to make up the work missed during their absences. Approval of such activities will be granted by the Student Academic and Financial Affairs Committee of the Academic Senate, and statements of the approved absence may be obtained from the Office of the Registrar. Course instructors are responsible for establishing reasonable deadlines and/or make-up materials for the missed work, and for clearly communicating this information to the relevant student(s), when absences for Institute activities are approved.

a. Student Responsibilities
    i. Individual students requesting approval from the Student Academic and Financial Affairs Committee are expected to do so at least two weeks before their requested absences;
    ii. Students are expected to inform their instructors about their approved absence by the end of the class meeting immediately following receipt of their approval notice.
b. Course Instructor Responsibilities
    i. Course instructors receiving timely notification of student absence (as outlined above) are expected to establish reasonable deadlines and/or make-up materials for missed work, and for clearly communicating this information to the relevant student(s).
c. Faculty/Staff Sponsor Responsibilities
    i. Faculty/staff sponsors of student organizations are expected to submit requests for absence approval, to the Office of the Registrar, at least one week before the date of the expected absence(s);
    ii. Faculty/staff sponsors are expected to provide the Office of the Registrar with roster changes in as timely a fashion as possible, to reduce negative impact on the ability of students and instructors to coordinate their plans;
    iii. Faculty/staff sponsors are expected to notify students of approved absences, along with instructions for notifying their instructors, within two business days of receipt of approval from the Office of the Registrar.

5. Students who are absent because of participation in a particular religious observance will be permitted to make up the work missed during their absence with no late penalty, provided the student informs the course instructor of the upcoming absence, in writing, within the first two weeks of class, and provided the student makes up the missed material within the time frame established by the course instructor. Exercising one's rights under this policy is subject to the Georgia Tech Honor Code. The course instructor is responsible for establishing reasonable deadlines and/or make-up material for the missed work, and for clearly communicating this information to the student. Students may choose to appeal to the Student Academic and Financial Affairs Committee of the Academic Senate for formal approval of this type of absence.
6. In alignment with **section 4.1.3** of the **University System of Georgia (USG)'s general Student Affairs policy**, students are encouraged to vote in all federal, state, and local elections. Students are encouraged to plan their voting to avoid missing classes. Students are also encouraged to participate in early voting whenever possible or to vote before, in between, or after classes on election day. For students who are registered elsewhere, they are encouraged to request absentee ballots by the appropriate deadlines. However, faculty should not penalize students for missing a class to vote on election day. In this case, a student should inform the course instructor at least 5 business days before election day about the absence for voting in writing. The course instructor is expected treat the absence as an officially excused absence if a student chooses to vote in person on election day.
7. Faculty members must provide students with reasonable accommodations for making up graded work missed while on jury duty.

V. Grades / Average

A. Grades

The letter grades used in the calculation of grade-point average (GPA) are as follows:

A	Excellent. Four quality points.
B	Good. Three quality points.
C	Satisfactory. Two quality points.
D	Passing. One quality point.
F	Failure. No quality points. If the course is required, the student must repeat it.

Guiding principles for the determination of grades:

- The grading system an instructor uses, including relative weighting of different types of grading instruments (e.g., _% for homework, _ % for quizzes) must be communicated to students in the course syllabus and aligned with the course objectives, teaching activities, assignments, and assessments. For guidance on specific approaches to grading, see the Center for Teaching and Learning website (https://ctl.gatech.edu/grading-and-assessment-resources).
- Students should be able to easily translate their scores on assignments to their course letter grade. The criteria for final grades should be clearly indicated on the syllabus. For example, A grade of "A" corresponds to a percentage grade of __% or above on graded assignments, a grade of "B" corresponds to a percentage grade of __ %-__% , etc.
- Students must be graded against a set of standards, not solely on their performance relative to their classmates.
- The grading process and scoring methods should be clear and provide students with meaningful feedback throughout the term, allowing students to reasonably predict progress towards their final grade as the semester advances.
- It is the responsibility of the instructor to design assignments and scoring criteria that are consistent with the published grading scheme. Grade adjustments may be made to increase, not lower, students' grades.

The following grades are used under special conditions and are not included in the calculation of grade-point average (GPA):

S	Satisfactory
U	Unsatisfactory
V	No credit earned. The "V" grade is used when a student audits a course.

The following grades are used in the cases indicated and are not be included in the calculation of grade-point average (GPA):

I	Incomplete. The "I" grade is used when, for reasons beyond her/his control and deemed acceptable by the instructor, a student whose academic performance had been satisfactory becomes unable to fulfill a course's requirements. If the student's academic performance had been so poor as to preclude her/his passing, the instructor shall assign the grade of "F." Regulation VII., "Deficiencies," outlines the removal of the "I" grade. See the Registrar's Office website for more guidance on the use of the Incomplete grade under Incomplete grade page under the Faculty section.
W	Withdrawal without Penalty. Withdrawals from individual courses without penalty are not permitted after 60 percent of the academic term has passed, as specified by the official Academic Calendar, except in cases of hardship, as determined by the Undergraduate Institute Curriculum Committee or Graduate Institute Curriculum Committee, as appropriate. Withdrawal from the Institute is not permitted after 60 percent of the academic term has passed, except in cases of hardship, as determined by the Undergraduate Institute Curriculum Committee or Graduate Institute Curriculum Committee, as appropriate. With the exception of part-time graduate students, those who withdraw from the Institute and receive all grades of "W" customarily will not be permitted to enroll in courses in the next succeeding academic term. Regulation VII., "Withdrawal and Readmission," outlines the Institue's policies on readmission. Faculty are expected to return to students a graded assignment or other meaningful performance feedback prior to the deadline for withdrawing from classes so that students can make informed decisions about withdrawing.
NR	Not Reported. The "NR" grade is used when, by no fault of the student, the instructors fails to submit grades before the deadline.
IJ	Incomplete Judicial. The "IJ" is used when academic misconduct has been reported in a class and the investigation is being conducted. It is a placeholder grade that is changed to a permanent grade as determined by the outcome of the investigation. It remains in place until the charges are adjudicated and a proper final grade is determined and assigned.

- Final grades are reported to the Office of the Registrar at the end of each academic term.
- Progress report grades are submitted to the Office of the Registrar for all classes numbered 1000 and 2000 in the Fall Semester and Spring Semester. These grades are used for advising students, not for calculating any grade-point average (GPA) at Georgia Tech. Progress report grades are "S" or "U." A grade of "U" indicates that, based on the work completed to that point in the academic term, the student's standing is in the "D" or lower range. Progress report grades must be submitted once 40 percent of the academic term has passed, as specified by the official Academic Calendar. The due date for reporting will be noon on Monday and the grades will be available to students that afternoon.
- If a final course grade is believed to be erroneous, the student should contact the professor as soon as possible. In general, no change of grade will be made after the end of the student's next academic term in residence.

B. Academic Average

The "academic average," or grade-point average (GPA), is the ratio of total quality points earned to total credit hours attempted.

When a student passes a course, she/he receives the designated number of credit hours; at the same time, she/he receives a certain number of quality points, based on the letter grade earned. Multiply the number of credit hours designated to the specific course by the numerical value of the letter grade earned to determine the number of quality points earned. Letter grades carry the following numerical values:

- "A" = 4
- "B" = 3
- "C" = 2
- "D" = 1

For example, when a student earns a letter grade of "C" in a 3-credit-hour course, she/he receives 6 quality points.

Grade-point averages are truncated after two decimal places.

A student who repeats a course for which the student has previously received credit (either by class work at the Institute, through AP/IB credit, or credit transferred from another school) forfeits the original credit in the event the student should fail the course on a subsequent attempt. Where a course has been repeated, both the original and subsequent grades are included in the average, but the credit is counted only once. The academic average includes all subsequent attempts, unless a grade substitution request has been approved and processed.

If a student takes the same course more than once, any later grade does not replace any earlier one. The academic average includes both attempts, unless a grade substitution has been approved and processed.

If a student takes a course on a Pass/Fail basis, the course is not included in their academic average.

For undergraduate students, the academic average is calculated by summing the number of quality points earned by the student for all courses in which they have enrolled as an undergraduate and dividing this sum by the number of credit hours designated to all courses in which they have enrolled as an undergraduate.

For graduate students, the academic average includes only the courses in which the student has enrolled after her/his entrance into the graduate division.

C. Grade Substitution for Undergraduate Students

Undergraduate students may repeat courses for grade substitution according to the following set of criteria. If these conditions are not met, the general policy governing repeated courses applies.

1. Undergraduate students may repeat for grade substitution up to two GT courses with posted letter grades of D or F. These courses will be excluded from calculation of their cumulative grade point average.
2. A course can be taken for grade substitution only once and must be repeated within one calendar year. Students who completed the Georgia Tech course prior to matriculating as first-year, degree-seeking undergraduates (e.g., joint/dual enrollment or in a non-degree seeking status) have one calendar year from their matriculation date to repeat the course.
3. A course is not eligible for grade substitution if the student was found responsible for any academic misconduct in that course regardless of how many times it is repeated.
4. Grades excluded under previous Institute rules (such as the Grade Substitution policy that was in effect up until 2019) count toward the maximum two courses allowed for substitution.
5. Once a grade substitution is posted, the student cannot remove the exclusion or change it to another course at a later date. A student cannot request a grade substitution after they have graduated.
6. The application for grade substitution must be filed with the Registrar's Office no later than the deadline for withdrawing from a course during the student's next term of enrollment after the course is repeated.
7. Students should not submit the form during the term they are repeating the course.

The original grade and the repeated grades will all appear on the official transcript. Once a grade substitution is applied to a course, the credit hours attempted and earned on the course will be removed from the calculation of the cumulative grade point. Excluded courses and hours will continue to be counted in calculations of satisfactory progress, for financial aid eligibility, and for tuition.

Students should be aware that many graduate and professional schools recalculate grade point averages in the process of considering an applicant for admission to such programs. This recalculation may include restoring the grades of the repeated classes and their effects on the cumulative grade point average.

The grade substitution policy (including, but not limited to, course eligibility, number of courses, time limits, and deadlines) is not subject to exceptions and *may not* be petitioned to the Undergraduate Institute Curriculum Committee.

Download Form

Frequently Asked Questions about the Undergraduate Grade Substitution Policy

D. Grade Substitution for Graduate Students

Graduate students may repeat a course for grade substitution according to the following set of criteria. If these conditions are not met, the general policy governing repeated courses applies.

1. Graduate students may repeat for grade substitution one GT course with posted letter grades of C, D or F. The course will be excluded from calculation of their cumulative grade point average.
2. The one-substitution limit holds during the entirety of their time as a graduate student regardless of the number of degree programs that they might enroll in.
3. A course can be taken for grade substitution only once. Since not all graduate-level courses are offered each term, the student should consult with their academic advisor about planning to retake the course. Due to course scheduling constraints, some courses may not be repeatable in a timely fashion. This assumes the course is offered again in a future term.
4. A course is not eligible for grade substitution if the student was found responsible for any academic misconduct in that course regardless of how many times it is repeated.
5. Once a grade substitution is posted, the student cannot remove the exclusion or change it to another course at a later date. A student cannot request a grade substitution after they have graduated.
6. The application for grade substitution must be filed with the Registrar's Office no later than the deadline for withdrawing from a course during the student's next term of enrollment after the course is repeated.
7. Students cannot submit the form until after the course is repeated.
8. The original grade and the repeated grade will all appear on the official transcript. Once a grade substitution is applied to a course, the credit hours attempted and earned on the course will be removed from the calculation of the cumulative grade point. The excluded course and hours will continue to be counted in calculations of satisfactory progress, for financial aid eligibility, and for tuition.
9. This policy cannot be used to extend the applicable dates of an I-20 or other type of visa.

The grade substitution policy (including, but not limited to, course eligibility, time limit, and deadline) is not subject to exceptions and *may not* be petitioned to the Institute Graduate Curriculum Committee.

Download Form

Applying for Graduate Grade Substitution

VI. Scholastic Regulations

A. Classification of Students

1. Undergraduate students, with the exception of non-degree-seeking students, shall be classified at the end of each academic term by the Office of the Registrar on the basis of the total number of attempted credit hours for which they have successfully earned credit in accordance with the following:

Freshman	0-29 credit hours
Sophomore	30-59 credit hours
Junior	60-89 credit hours
Senior	90+ credit hours

2. Graduate and special students who have completed all requirements for a particular classification, as defined by their major department, may request reclassification through their major department.
3. Students scheduled for at least twelve (12) credit hours in a semester are classified as full-time students; those scheduled for six to eleven (6-11) hours are classified as part-time students; and those scheduled for one to five (1-5) hours are classified as less-than-part-time students.

B. Eligibility for Class Rings

A student may purchase a class ring any time after successfully earning credit for 70 attempted credit hours.

C. Academic Standing

1. The assignment of academic standing is based on both the student's most recent academic term and their cumulative grade-point average.
2. The minimum satisfactory grade-point average (GPA) is 1.70 for freshmen and joint-enrolled high school students; 1.80 for sophomores; 1.95 for juniors; 2.00 for seniors and special undergraduates; 2.70 for master's and special graduate students; and, 3.00 for doctoral students.
3. Students not on academic probation are in good academic standing.
4. Academic warning
   a. Academic warning is a subcategory of good academic standing, differing only in the maximum allowable schedule load.
   b. A student who has a cumulative grade-point average below the minimum satisfactory scholarship requirement, or whose cumulative grade-point average for work taken during any term is below this requirement, shall be placed on academic warning.
   c. A student on academic warning whose grade-point average for the academic term is above the minimum satisfactory scholarship requirement and cumulative grade-point average is below the minimum satisfactory scholarship requirement shall remain on academic warning.
   d. A student on academic warning will be deemed in good academic standing and removed from academic warning if both the grade-point average for the academic term and the cumulative grade-point average are above the minimum satisfactory scholarship requirement.
5. Academic probation
   a. A student on academic warning whose grade-point average is below the minimum satisfactory scholarship requirement for any academic term shall be placed on academic probation.
   b. An undergraduate student in good academic standing whose grade-point average for any academic term is below 1.00, based on at least six graded hours, shall be placed on academic probation.
   c. A student also may be placed on academic probation through other actions, as described in the following section.
   d. A student on academic probation will be deemed in good academic standing and removed from academic probation if both the grade-point average for the academic term and the cumulative grade-point average are above the minimum satisfactory scholarship requirement.
6. Dismissal for unsatisfactory scholarship
   a. The Institute may drop from the rolls at any time a student whose record in scholarship is unsatisfactory.
   b. A graduate student whose grade-point average for any term is 2.00 or below may be placed on academic probation or dropped, regardless of the student's previous record.
   c. A student on academic probation whose grade-point average for the academic term of probation is below the minimum satisfactory scholarship requirement and whose cumulative grade-point average is below the minimum satisfactory scholarship requirement shall be dropped from the rolls for unsatisfactory scholarship.
   d. An undergraduate student on academic warning whose grade-point average for any term is below 1.00, based on at least six graded hours, and cumulative grade-point average is below the minimum satisfactory scholarship requirement shall be dropped from the rolls for unsatisfactory scholarship.
   e. The record of a student on academic probation whose grade-point average for the academic term in unsatisfactory, but whose overall academic record is satisfactory, may be reviewed by the Institute Undergraduate Curriculum Committee or the Institute Graduate Curriculum Committee, as appropriate. The student may be dropped or may be continued on academic probation.
7. Academic review
   A student who normally would be dropped from the rolls for academic deficiencies, but appears from the record not to have completed the academic term, may be placed on academic review. This is a temporary standing that makes the student ineligible for registration. If no acceptable explanation is given within a reasonable time, the standing is changed to drop.
8. The academic standing regulations given previously for graduate students do not preclude a school from having more rigorous requirements.

D. Satisfactory Academic Progress Toward Degree Completion

1. Undergraduate Students.
   a. Satisfactory academic progress toward degree completion means that for each term of enrollment, the student completes a course or courses with the minimum necessary grades that are either prerequisites for courses required in the major or that are degree applicable to stay on track towards graduation. It is noted that some majors may require a minimum grade that is higher than "D" in specified courses.
      i. If a student does not make any progress toward degree completion during an academic term (by either not passing or earning minimum required grades or completing any courses that apply toward unfulfilled degree requirements in the major), they will be reviewed by their academic unit/major and a success plan for the next academic semester must be

completed and submitted to the Registrar's Office in the form of a departmental contract.

ii. If a student fails to make any progress toward degree completion in the following term of enrollment, they may be placed on academic warning (regardless of grade point average).

b. If a student withdraws from all courses in a term, there will be no change in status. However, if a student withdraws from all courses in a second term of enrollment, they will be placed on warning for lack of satisfactory academic progress towards degree completion. If withdrawal occurs in a third term of enrollment, the status will be revised to probation. If withdrawal occurs in a fourth term of enrollment, the student will be placed on academic dismissal for lack of satisfactory progress towards degree completion. The number of withdrawal terms is cumulative and irrespective of whether they occur consecutively. Withdrawals either during the term or when approved retroactively through a petition to the faculty count for this purpose.

c. Students applying for readmission may be denied based on prior terms of withdrawals.

d. Eligibility for financial aid, NCAA Division I sports, etc. may be predicated on different satisfactory progress requirements. Information on those requirements should be directed to the appropriate office on campus and should not be confused with this academic policy.

2. Graduate Students in Master's Programs.

a. Students should plan to graduate well within six years from the time that they first enrolled in their master's degree program. Satisfactory academic progress toward degree completion means that within each academic year (summer-fall-spring), the student completes at least two courses with the minimum necessary grades required in the major or that are degree applicable to stay on track towards graduation.

i. If enrolled in a thesis program and taking thesis hours, the student must earn a satisfactory grade in thesis hours.

ii. If the student exceeds the 6-year rule for degree completion, the program may place the student on academic Warning, Probation or Dismissal.

iii. If a student does not make satisfactory degree progress toward degree completion during an academic year (by either not passing or earning minimum required grades, or by not completing two courses that apply toward unfulfilled degree requirements in the major), they will be reviewed by their academic unit/major and a success plan for the next academic semester must be completed and submitted to the Registrar's Office in the form of a departmental contract.

iv. If a student fails to make any progress toward degree completion in the following term of enrollment, they may be placed on academic warning (regardless of grade point average).

b. If a student withdraws courses in a consistent manner or withdraws from all courses in a term in a consistent manner, the program will review the student's record each term and adjust academic standing as needed with the Registrar's Office. A student could be placed on academic Warning, Probation, or Dismissal depending on the pattern(s) of course and term withdrawals. Students applying for readmission may be denied based on prior terms of withdrawals.

c. Eligibility for financial aid, NCAA Division I sports, etc. may be predicated on different satisfactory progress requirements. Information on those requirements should be directed to the appropriate office on campus and should not be confused with this academic policy.

E. Maximum Schedule Load

1. The maximum number of credit hours for which an undergraduate student may register in a Fall Semester or Spring Semester, based on their academic standing, is as follows:

Good	21 credit hours
Warning	16 credit hours
Probation	14 credit hours

2. The maximum number of credit hours for which an undergraduate student may register in a regular Summer Session, based on their academic standing, is as follows:

Good	16 credit hours
Warning	14credit hours
Probation	12 credit hours

3. Students who are on probation or probation from dismissal are required to enroll in and successfully complete GT 2100 by earning a grade of 'S'. This course does not count toward graduation requirements nor would it count against the maximum course loads listed above.
4. A graduate student may register for a maximum of 21 credit hours in a Fall Semester or Spring Semester and a maximum of 16 credit hours during a regular Summer Session.
5. Requests for schedule overloads must be recommended by the student's major school and approved by the Institute Undergraduate Curriculum Committee or Institute Graduate Curriculum Committee, as appropriate.
6. During Phase 1 Registration, the Institute reserves the right to limit undergraduate students to 18 credits maximum for the Fall Semester and Spring Semester and to limit graduate students to less than 21 credit hours depending upon the needs of the program or school.

F. Academic Honors

The Institute encourages excellence in scholarship and gives official recognition to undergraduate students whose work is superior in any given academic term.

1. Dean's List

a. Full-time Students. The Dean's List includes all degree-seeking undergraduates who, during the preceding academic term, earned a grade-point average (GPA) of 3.00 or higher, completed a schedule of at least twelve credit hours of coursework on a letter-grade basis, and are not on academic warning or probation or subject to any disciplinary action. All grades must be reported.

b. Part-time Students. The Part-time Dean's List for students enrolled in less than 12 hours includes all degree-seeking undergraduates who, during the preceding academic term, earned a grade-point average (GPA) of 3.00 or higher, completed a schedule of at least three credit hours of coursework on a letter-grade basis, and are not on academic warning or probation or subject to any disciplinary action. All grades must be reported.

2. Faculty Honors

a. Faculty Honors includes all degree-seeking undergraduates who, during the preceding academic term, earned a grade-point

average (GPA) of 4.00, completed a schedule of at least twelve credit hours of coursework on a letter-grade basis with no "W" grades, and are not on academic warning or probation or subject to any disciplinary action. All grades must be reported.

G. Change of Major

1. Undergraduate students, by filing the required form, will be permitted one unrestricted transfer between majors until they have accumulated credit for sixty hours (this includes AP, IB, and other types of transfer credit including courses taken at Georgia Tech). After sixty hours or upon subsequent request for transfer, the transfer will be permitted at the discretion of the school that the student is seeking to enter. Students who transfer from another institution to pursue a degree at Georgia Tech will be permitted to change their major only at the discretion of the school that the student is seeking to enter. Transfer students are not eligible for the one unrestricted change of major.

   The Institute reserves the right to limit access to programs due to capacity or other issues that affect how many students can be accommodated in that program. Should a School wish to limit access to a program, permission must be sought from the Provost's Office and, if granted, the program website must place a notice on its website with an effective date. The Office of the Registrar will be notified when the approval is granted and will place a notice in a visible location on its website as well. Before deciding about a change of major, the student should consult with the academic advisor in the new major to determine if any restrictions are in place at that time.

   Some programs have existing change-of-major conditions due to grade, GPA, or other requirements such as presentation of a portfolio that may limit change of major.

   - Industrial and Systems Engineering
   - Mechanical Engineering
   - Music Technology
   - Computer Science (Due to high demand, the conditions are placed on incoming first-year students beginning Summer 2024.)

   Other programs that wish to implement similar conditions must first propose the change to the Institute Undergraduate Curriculum Committee.

2. Graduate students, by filing the required form, may transfer with the concurrence of the schools involved and the graduate dean.
3. Students who change their majors must complete the degree requirements in the Catalog that was effective for the term in which the change of major became official, or any subsequent Catalog.
4. Admitted first-year students must confirm their major in their Admission Portal after paying their enrollment deposit and prior to FASET Orientation. Visit the admission website for details.

H. Exceptions

Exceptions to these scholastic regulations may be made by the Institute Undergraduate Curriculum Committee or the Institute Graduate Curriculum Committee, as appropriate, whenever a consideration of the student's complete record indicates that the application of a specific regulation will result in injustice.

I. Course Requirements

1. Each course shall have a syllabus and course policies provided to students before the first class meeting. Each syllabus shall include an outline of the course objectives (learning outcomes), required materials, criteria used in determining the course grade, any other requirements for successful completion of the course, and a statement about services available through the Office of Disability Services. Each syllabus shall refer to acceptable student conduct as it relates to the Georgia Tech Honor Code and Student-Faculty Expectations Agreement in the Rules and Regulations section of the Catalog. Students shall be informed of any changes made to the syllabus and course policies with reasonable time to adjust to these changes. Any changes to the syllabus after the first week of the term should be done prior to the last day to withdraw from the course with a W grade. Instructors should refer to the resources on the CTL website for developing their syllabi.
2. In all courses, faculty are expected to return to students a graded assignment or other meaningful performance feedback prior to the deadline for withdrawing from classes so that students can make an informed decision about withdrawing or changing the grade mode.
3. Progress Report grades of "S" or "U" will be submitted to the Office of the Registrar for all classes numbered in 1000 and 2000 ranges each semester prior to Mid-term, which is typically on the sixth week of Fall Semester and Spring Semester and on the fifth week of the Summer Session. A Progress Report grade of "U" generally indicates a performance level of "D" or lower. These grades are not permanent and never appear on a transcript, but they are issued to help students understand their academic performance in each of their courses and obtain academic help from the faculty and the many academic support services available on campus.
4. Students shall not be penalized if they cannot attend instructional, lab, or examination sessions that are not institutionally scheduled in accordance with the standard protocols.
5. Students shall have the opportunity to review graded material in a timely fashion and with reasonable access to grading instruments and/or grading criteria for individual assignments, projects, or exams.

VII. Deficiencies

A. About Deficiencies

1. A student who has received a grade of "I," "F," or "U" in a course has a deficiency in the course.
2. A student whose final grade is "F" or "U" has failed the course. The student must repeat and pass the course before credit will be allowed.

B. Removal of Deficiencies

1. When a grade of "I" ("Incomplete") is assigned in a course, the "I" grade must be removed and the grade change reported by the end of the student's next academic term in residence or, if the student has not been enrolled, by the end of the academic term one calendar year from the date the incomplete was assigned. Failing to remove the "I" in the allotted time will result in the grade of "I" being changed to the grade of "F." To remove the "I" grade, the student should consult with the instructor as soon as possible after the academic term is over and complete whatever remaining coursework is outlined by the instructor. Repeating the course for credit does not remove the grade of "I."

2. When a course in which a "D" grade was earned is repeated and a grade of "F" is earned, the student must file a Petition to the Faculty to be allowed to use the "D" grade to meet graduation requirements.
3. A degree candidate who has otherwise completed all requirements for graduation and who has an "Incomplete" in laboratory work taken during their final academic term in residence may remove the "Incomplete" at the convenience of the department of instruction concerned.

VIII. Withdrawal/Readmission

A. Withdrawal

1. Withdrawal from the Institute will not be permitted after 60 percent of the academic term has passed, except in cases of hardship as determined by the Institute Undergraduate Curriculum Committee or Graduate Curriculum Committee, as appropriate. With the exception of part-time graduate students, students who withdraw from the Institute and receive all grades of "W" will not ordinarily be permitted to re-enroll the following term. A student may withdraw from the Institute via the Student Information System by the posted deadline in the official Academic Calendar. All holds on the student's record must be cleared prior to withdrawal.
2. Students who cease attendance without withdrawing via the Student Information System receive grades of "F," "U," or "I" for their ongoing courses.
3. Permission and/or formal resignation are not required when a student has completed an academic term and does not register for the following term.
4. See Regulation V.A.3 for further information on grading as it relates to withdrawal.

B. Readmission

1. Any student who is not enrolled for three or more consecutive terms (counting Summer Session) must apply for readmission. This application, with all the pertinent supporting information, must be submitted to the Office of the Registrar before the deadline for the academic term for which readmission is requested. Deadlines are listed below.

Term	Date
Fall	July 1
Spring	December 1
Summer	April 1

2. Applications received after these deadlines will not be accepted.
3. Readmission is not guaranteed. Schools/Colleges must recommend readmission for any student wishing to return in majors under their jurisdiction.
4. The readmission policy supersedes the change of major policy. No School/College is obligated to readmit a student even if that student is within their limit for requesting a non-restricted change of major. Once readmission applies, the change of major process is not applicable including the non-restricted change of major.
5. Any student who has attended any other college or university should plan their readmission process in a way that allows ample time for their official transcript(s) from any other institution to arrive at Georgia Tech. If official transcripts have not been received prior to the last day of the Registration Period, the student seeking readmission will not be allowed to register.
6. Any student in good standing who is not enrolled for one single term will be allowed to re-enroll without applying for readmission to the Institute. This regulation makes no distinction among Fall Semester, Spring Semester, and Summer Session.
7. A student who is on academic warning or academic probation and who does not enroll for two terms may have a registration hold placed on their account. If a hold is placed, the student will be notified and the hold must be cleared by their major school. For example, if a student is placed on academic probation at the end of the Fall Semester and fails to enroll by the close of the Registration Period for the Spring Semester, a registration hold may be set, and it must be cleared by the student's major school before they can register for any future academic term.
8. A student who has been dropped once for unsatisfactory scholarship usually will not be readmitted. A student who seeks an exception to this rule must have been out of the Institute for at least one term and have had a conference with the major school concerning the readmission. The Readmission Application Deadline for a student who has been dropped is two months prior to the published Readmission Application Deadline for the academic term.
9. A student who is dropped a second time for unsatisfactory scholarship will not be readmitted to the Institute.
10. A student who is on expulsion, defined as permanent separation from the Institute, is not eligible for readmission.
11. Students are readmitted under the current catalog that is in effect at the time of readmission. If a student wishes to follow the degree requirements from a catalog in effect prior to the term of readmission, she/he must make a request to the major school. There is no guarantee that such a request will be granted, and readmitted students should be prepared to follow the degree requirements as outlined in the current catalog. Programs of study that have been deactivated or terminated are not available for readmission. Students who were enrolled in a program of study that has since been deactivated are eligible for readmission to the Institute; however, they must select an active program at the time of readmission. Once a decision is made to no longer admit students to a program of study due to an impending deactivation or termination, readmission is also not allowed.
12. Any student, except a part-time graduate student, who withdraws during an academic term and wishes to return the following academic term must complete a Petition to the Faculty for consideration. This petition must be submitted to the Office of the Registrar before the deadline for the academic term for which readmission is requested.
13. Students may be eligible for academic renewal. See below for more information.
    a. University System of Georgia undergraduate students who have been readmitted or reinstated after a period of absence of three (3) calendar years or longer are eligible for academic renewal. Academic renewal for the student signals the initiation of a new grade-point average to be used for determining academic standing. This provision allows University System of Georgia degree-seeking students who earlier experienced academic difficulty to make a fresh start and have one final opportunity to earn an associate or bachelor's degree (BR Minutes, June, 1995, p. 7). The complete policy is available online at: www.usg.edu/academic_affairs_handbook/section2/handbook/2.5_grading_system/
    b. The application for academic renewal shall be considered as a petition to the Undergraduate Curriculum Committee.

C. Leaves of Absence

1. Students may be eligible for an approved leave of absence. Interruption in enrollment due to circumstances outside the student's control may qualify for an approved Leave of Absence. This may include, for example, required military service.
2. It should be noted that an approved Leave of Absence would be effective in a future term (see item 12 for more details). Students on an approved Leave of Absence would not have to apply for re-admission and would be able to retain their email accounts during the approved absence. Prior to returning, the student would have to notify the Registrar's Office so that the record could be reactivated for re-entry.
3. The Leave of Absence would cover eligible students for at least three and no more than seven semesters (including Summer). If the seventh semester is a Spring term, students may opt to return in either the Summer or Fall term.
4. Students who are on an Approved Leave of Absence may not attend class, live in campus housing, or access other campus services.
5. The form to request an Approved Leave of Absence is on the Registrar's Office website under the student tab, forms and student records.
6. The Leave of absence may be used more than once, but for no more than seven total semesters during the student's enrollment at Tech.
7. Students who have been placed on academic drop or suspended or expelled for disciplinary reasons may not participate.
8. Students must clear up any other issues such as registration holds or providing any requested documentation prior to re-entry. The Approved Leave of Absence does not override other considerations or restrictions on enrollment.
9. Students should apply for the Leave of Absence as soon as possible. Applications for Leave of Absence will require review and signatures by the Office of the Dean of Students and the student's major academic advisor. Other signature approvals, such as the Office of International Education and Financial Aid may also need to be obtained.
    - Students should bear in mind the time limits as outlined in section 11 below in determining the anticipated date of return.
    - Readmission is required when three or more consecutive terms have been missed (which includes Summer). Once the student has made the decision that they will have to or need to be out for three or more consecutive term and the student wishes to return to Tech without being readmitted, the application for a Leave of Absence should be filed with the Registrar's Office.
    - The clock begins when the student does not enroll for a third consecutive term. The Leave of Absence Request would have to be for the third consecutive missed term to avoid readmission.
10. The Leave of Absence cannot be approved retroactively.
11. Students must file a Return from Leave of Absence form to return. If the leave exceeds the 7 semester time frame, the student must apply for readmission. The form is on the Registrar's Office website under the student tab, forms and student records.
12. The Leave of Absence, if approved, would be effective in a future term. It will not be approved to be effective in the term in which application is made. It in no way supplants or replaces any other policy. If a student needs to withdraw from classes within a given term, they should follow the withdrawal process and if a Leave of Absence is needed or desired, it would be effective for a future term or terms only as approved.
13. Normally, students would not enroll in courses at another school while on Leave of Absence. However, students who wish to or need to take classes at another institution must obtain prior approval from the academic unit and from the Registrar to do so. Students who fail to obtain prior permission may forfeit their opportunity to transfer the credit back to Georgia Tech. In all cases, students on Leave of Absence should consult with their academic advisor for information pertaining to transfer-credit, the 36-hour rule, and other applicable rules and regulations.

D. Other Evidence for Readmission

Coursework pursued at another institution after withdrawal or dismissal for unsatisfactory scholarship from Georgia Tech may be considered as evidence for readmission. Please refer to the Registrar's website for guidelines regarding transfer credits: https://registrar.gatech.edu/records/transfer-credit.

E. Study Abroad

Any student in good standing who chooses to participate in an approved study abroad program for two or more terms must complete a Student Information Update Form with the study abroad coordinator prior to departure. This form enables the student to re-enroll for the term of "planned re-entry" without submitting a formal readmission application. It will be the student's responsibility to inform the study abroad coordinator of any change to her/his planned re-entry date.

IX. Scheduling

A. General

1. All previously scheduled coursework takes precedence over newly scheduled material. Therefore, all work that is incomplete from a previous term should be completed, or arrangements to complete it should be made prior to placing emphasis on new coursework.
2. Students must follow the approved curriculum of the academic school in which they are registered. Students who do not follow the approved curriculum may be denied registration privileges.
3. Each student is strongly advised each term to schedule all prerequisite courses. A student who has not completed the stated prerequisites for a course but believes she/he has the necessary knowledge to fulfill prerequisite requirements should contact the department of instruction.
4. The completion of incomplete work from a previous term and the scheduling of out-of-sequence courses are the responsibility of the student, and, consequently, she/he will be held accountable. The number of scheduled credit hours allowed for an academic term may be adjusted to take into consideration the amount of incomplete work remaining regardless of the student's academic standing.
5. Students may not repeat courses on a letter-grade basis in which the grade of "B" or higher has been earned previously.
6. Subject to approval by a faculty advisor, a course may be taken more than once for academic credit. All grades and hours will count in determining the student's grade-point average (GPA), but the course will be counted only once for credit toward a degree.
7. See Regulation X, "Pass/Fail Grading," for the Institute's rules regarding courses taken on a Pass/Fail basis.

B. Academic Load

1. Maximum credit hour loads are explained in Regulation VI, "Scholastic Regulations," Section D, "Maximum Schedule Load."

Any hours above these limits must obtain prior approval from the Undergraduate Institute Curriculum Committee or the Graduate Institute Curriculum Committee, as appropriate.

2. Graduate students must maintain a minimum of three credit hours each academic term. Exceptions to this regulation may be made during the term in which the student graduates.

C. Auditing of Courses

1. The auditing of a course will be permitted for a regularly enrolled student who has obtained the approval of her/his advisor and the departments concerned. Such a course counts at full value in computing the student's course load for an academic term.
2. The grade of "V" (i.e., "Visitor") is earned when a student audits a course. The "V" grade has no effect on a student's grade-point average (GPA).
3. No academic credit is granted for auditing a course.
4. Students are not permitted to change to or from an auditing status except through the regular procedures for schedule change or withdrawal. Any student who does not meet the instructor's requirements for a successful audit will be withdrawn with a grade of "W" assigned at the end of the academic term.
5. Members of the faculty or staff of the Georgia Institute of Technology may sit in on, rather than audit, a course with the permission of the instructor. The permission is granted on a space-available basis in the class.

D. Attending Classes

1. Students may attend only those particular classes for which they are registered and paid.

E. Undergraduate Students Taking Graduate Courses

A senior with a grade-point average (GPA) of at least 2.7 may enroll in a graduate course if she/he obtains permission from the school or department offering the course.

1. Up to twelve credit hours earned as an undergraduate student may count toward earning a master's degree if the following conditions are satisfied.
   a. The student was in residence at Georgia Tech for at least two semesters before registering for the course(s).
   b. The student did not apply credit for the course toward a bachelor's degree. Special exceptions may apply in certain schools, as described below.
      i. If student pursues both a bachelor's and master's at Georgia Tech, and if both degrees are in the same discipline, she/he may apply up to six credit hours of graduate-level credit in the major discipline to satisfying the requirements for both degrees. Because some master's degree programs do not have any unique undergraduate counterpart program, and because some master's programs are offered by several schools, the definition of "discipline" will be broadly interpreted in such cases. To qualify for this option, a student must complete the bachelor's degree with a cumulative grade-point average (GPA) of 3.5 or higher, and she/he must complete the master's degree within a two-year period following the award date of the bachelor's degree.

F. Graduate Students Taking Undergraduate Courses

Graduate students who wish to take a 1000- or 2000-level course must obtain a permit from the department teaching the course. The student must have the department of instruction enter a permit on her/his account, and then come in-person to the Office of the Registrar to have the course added to her/his schedule. Institute policy allows a graduate student to take a 1000- or 2000- level course on a Pass/Fail or audit basis only.

X. Pass/Fail Grading

A. General

1. At the option of the student's major school, credit toward a bachelor's degree may be allowed for courses taken under the pass/fail system and completed with a grade of "Pass."
2. The major school must approve all pass/fail courses included in the final program of study, and students should be aware of school requirements.
3. In graduate programs, thesis research hours will be evaluated on a pass/fail basis.
4. Pass/fail enrollment in any course may be restricted by the school or department offering the course.
5. Students who are permitted to register under the pass/fail system will be so designated on the official class rolls. The grades recorded will be "S" for "Satisfactory" or "U" for "Unsatisfactory." These grades will not be included in the calculation of the grade-point average and cannot be changed to a grade that will count in the average.
6. Withdrawals from courses taken on a pass/fail basis will follow the same rules that govern withdrawals from courses included in the grade-point average.
7. The deadline to change the grade mode from letter grade to pass/fail (and vice versa) is the same day as the Last Day to Withdraw from Individual Courses without a Penalty.

Grade mode changes are allowed online during the Registration Period. After the Registration Period ends, the following form must be completed and submitted to the Office of the Registrar.

Download Form

B. Credit Hours Permitted

1. The maximum number of credit hours that a student may earn on a pass/fail basis is related to the number of credit hours required for the program of study in which the student is enrolled.

Hours included in program of study	Hours allowed on pass/fail basis
45 to 70 credit hours	3 credit hours
71 to 90 credit hours	6 credit hours
91 or more credit hours	9 credit hours

1. For a second undergraduate degree, these limits apply to the credit hours included in the program of study for that second degree.
2. A master's degree program of study may include up to three semester credit hours on a pass/fail basis.

XI. Cross Enrollment and Concurrent Registration

A. General

1. Students who are enrolled at Georgia Tech may not receive credit for courses completed at another institution during the same academic term, unless prior permission has been obtained for cross enrollment or concurrent registration, as described in this section.
2. With the approval of the student's major school, a student may schedule courses at any one of the colleges or universities comprising the Atlanta Regional Consortium for Higher Education (ARCHE), if such courses are not available in a particular term at Georgia Tech. A list of participating institutions is available from the Office of the Registrar.
3. All cross enrollment registration activities are performed at the student's home institution.
4. For institutions not participating in cross enrollment, a student must apply in advance for permission to be concurrently registered at both Georgia Tech and the other institution, except during the Summer.

B. Eligibility and Other Rules

1. Cross Enrollment:

    a. Is available is available only to degree-seeking juniors, seniors, and graduate students.

    b. Students will not be allowed to cross enroll for more than two courses per academic term.

    c. International Plan students may cross enroll for a language course(s) not offered at Georgia Tech as early as the second semester of their first year of enrollment. Special permission to do this will be granted to accepted International Plan students only. Forms and procedures are available from the Office of the Registrar. Any student seeking an exception to these eligibility requirements should contact the Office of the Registrar.

    d. Courses completed through cross enrollment is allowed during the final 36-hours of degree completion (the 36-hour rule is not applicable).

2. Concurrent Registration:

    a. Is available during the Fall and Spring terms only to degree-seeking juniors, seniors, and graduate students.

    b. Is available during the Summer term to anyone. Students do not need special permission (a petition to the faculty) for concurrent registration during the Summer and they do not have to be in junior, senior, or graduate student status.

    c. International Plan students may cross enroll or register concurrently for a language course(s) not offered at Georgia Tech as early as the second semester of their first year of enrollment. Special permission to do this will be granted to accepted International Plan students only. Forms and procedures are available from the Office of the Registrar. Any student seeking an exception to these eligibility requirements should contact the Office of the Registrar.

    d. Courses completed through concurrent registration will not be degree applicable if enrolled in the student's last 36-hours of degree completion. In order to have these courses apply to degree requirements, the student must submit a petition to the faculty for a waiver of the 36-hour rule and explain why the concurrent registration is necessary.

3. To participate in cross enrollment *or* concurrent registration, a student must be in good standing during the term when the application is processed.

4. During the term of cross enrollment *or* concurrent registration, the student must enroll in three or more credit hours at Georgia Tech and be in good standing. The total academic load carried at all institutions combined may not exceed the number of credit hours for which the student would be allowed to register at Georgia Tech.

5. Any cross enrollment or concurrent registration course must be completed with a grade of "C" or better in order to receive credit for the course.

    a. Credits earned under cross enrollment will be treated as transfer credit but will count as in-residence credit toward a degree.

    b. Credits earned under concurrent registration will be treated as transfer credit and will not count as in-residence credit toward a degree.

    c. Grades received in cross enrollment *or* concurrent registration courses will not be included in the calculation of the grade-point average.

    d. No credit will be awarded for courses completed under cross enrollment *or* concurrent registration until an official transcript from the participating institution is received by the Office of the Registrar.

XII. Examinations

A. General

1. Some units offer Departmental Exams to undergraduates. For details, please see https://catalog.gatech.edu/academics/undergraduate/credit-tests-scores/departmental-exams/.
2. If the instructor considers it necessary during an examination, students may be required to present their student identification card to the instructor or an authorized representative.

B. Examinations for Advanced Standing

1. Students who offer satisfactory evidence that they are qualified to do so may receive credit for a course by examination. Such an examination is called an "Examination for Advanced Standing."
2. Examinations for advanced standing require the recommendation of the department of instruction in which the course is offered, payment of the appropriate fee to the Office of the Bursar, and authorization by the Office of the Registrar.
3. Examinations for Advanced Standing will usually be offered during the Final Examination Period.
4. A student will not be allowed to take an Examination for Advanced Standing in a given course more than twice.

5. Students will not be allowed to take an Examination for Advanced Standing in a course for which any prerequisite has not been met, except with the consent of the school offering the course.
6. An Examination for Advanced Standing will be reported with an "S" or "U" grade. Neither grade will be included in the calculation of grade-point average (GPA).
7. Advanced standing is not allowed for laboratory or studio classes, except with the consent of the school offering the course.
8. Students may not use more than nine credits of advanced standing to meet degree requirements.
9. The School of Modern Languages does not offer Advanced Standing examinations, although students may receive advanced standing credit for up two modern languages courses in the same language of study for a total of 6 to 8 credits upon successful completion (with a C or higher) of coursework as outlined in numbers 4 and 5 below. The only courses for which Advanced Standing credit may be given are 1001, 1002, 2001, and/or 2002 in the languages currently offered in the School of Modern Languages at Georgia Tech. No 3000- or 4000-level Advanced Standing credit will be granted.

   For students seeking Advanced Standing Credit for 1 course (3-4 credits), there are four options:

Advanced Standing Credit	Required course(s) to successfully complete (with a grade of C or higher) before applying	
1001	1002	2001
1002	2001	N/A
2001	2002	N/A
2002	3XXX or 4XXX	N/A

For students seeking Advanced Standing Credit for 2 courses (6-8 credits), there are three options:

Advanced Standing Credit		Required course(s) to successfully complete (with a grade of C or higher) before applying	
1001	1002	2001	2002
1002	2001	2002	3XXX or 4XXX
2001	2002	3XXX or 4XXX	3XXX or 4XXX

C. Final Instructional Class Days and Reading Periods

The following applies to the standard academic terms, including the Fall Semester, Spring Semester, and Full Summer Session. It does not apply to the Early Short Summer Session and Late Short Summer Session. Given the variability in the exact timing of the Full Summer Session, the Office of the Registrar will adjust the final instructional class days and reading periods for this semester only in order to meet required instructional time. This policy replaces the former Dead Week (Week Preceding Final Examinations) policy.

1. **Final Instructional Class Days**

   a. Final Instructional Class Days are scheduled during each regular term including the Full Summer Session and are the last two instructional days of the term immediately preceding the first reading period.

   b. No tests or quizzes are to be administered on these days. Lab quizzes and/or practicums may be given in courses comprised of both a lecture and a scheduled lab, wherein the lecture carries at least two credits.

   c. For all courses, graded homework or assignments, lab reports, course projects, demonstrations, studio reviews, and presentations may be due during these two days, provided that they are listed on the syllabus at the start of the semester.

   d. All quizzes and tests should be graded and reported to students on or before the last Final Instructional Class Day.

2. **Reading Periods**

   a. Reading Periods will be designated to provide time for students to prepare for final examinations.

   b. No classes meet. This includes labs, recitations, projects, design/capstone courses, and studios.

   c. No assignments, projects, presentations, or other graded activities are allowed.

   d. Instructors may schedule optional study review sessions for students during reading periods, but no credit or extra credit may be attached to these optional sessions. New content may not be covered, and any materials (e.g., handouts, slides, practice problems, etc.) that are provided at these optional review sessions must be made available to all students. This provision does not require that such optional sessions be audio or video recorded.

3. Requests for exceptions to the Final Instructional Class Day and Reading Period policies may be made in writing by the Dean of the College (or their designee) to the Student Rules and Regulations Committee (SRR). The SRR will then make a recommendation to the Undergraduate Institute Curriculum Committee or Graduate Institute Curriculum Committee, as appropriate, for approval or denial. Requests must be made no later than the academic term prior to the desired term of implementation and will be regularly reviewed.
4. Student concerns may be discussed with the faculty member and/or reported to the Chief Academic Officer of the department of instruction, or with the Assistant Provost for Academic Advocacy and Conflict Resolution. For more information, see the Student Academic Grievance Policy.

D. Final Examinations

1. In all courses of the Institute offered for a letter grade, a final assessment, either a final examination or some alternative form, shall be administered. The decision on the type of final assessment shall be made by the instructor of record, and an announcement of the course's final assessment policy shall be made to the class by the end of the first week of the term (close of Phase II registration) and included in the course syllabus.
2. A change to a class's type of final assessment after the close of Phase II registration must be announced to all students in the class before the last day to withdraw from a single class.
3. In regularly scheduled, full-semester courses of the Institute, final examinations shall be scheduled during the Final Examination Period at the time specified in the official Final Examination Schedule as distributed by the Office of the Registrar, and meeting times for alternative final assessments shall not be scheduled during the Final Examination Period at any time other than the time specified in the official Final Examination Schedule.
4. No assessment other than a final examination or an alternative final assessment may be due during the Final Examination Period.

5. Requests to change a class's final examination time within the Final Examination Period must be submitted to the Chief Academic Officer of the department of instruction for approval no later than one week before the beginning of the Final Examination Period. Any such request must have the unanimous approval of the class as shown by secret ballot, as well as approval by the instructor of the class.
6. A change in the scheduling of a final assessment during the Final Examination Period for an individual student ordinarily will not be permitted; however, such a change may be allowed for hardship cases at the discretion of the instructor. The request for a change must be justified in writing by the student and shall be submitted to the instructor prior to Final Examination Period and may be rescheduled to an appropriate time.
7. In the event a student has two final assessments scheduled for the same time, the course having the lower number shall be considered in conflict and the student shall notify the instructor no later than two weeks before the first day of the Final Examination Period. In such case, the final assessment in that course shall be given during the Conflict Examination Period or, by agreement of the instructor and the student, at a mutually satisfactory time.
    a. If the student notifies the instructor after the above deadline but before the first day of the Final Examination Period, the student shall, at the discretion of the instructor:
        i. receive a course grade of "I" (Incomplete), with an opportunity to take a makeup final examination the following academic term (and have the course grade changed as warranted by the results of the test), or
        ii. be given the final assessment during the Conflict Examination Period or at an alternative time during the Final Examination Period.
    b. A student who fails to notify the instructor of the conflict before the first day of the Final Examination Period shall, at the discretion of the instructor:
        i. receive a score of zero on the final assessment, or
        ii. be given the final assessment during the Conflict Examination Period or at an alternative time during the Final Examination Period.
8. In the event a student is scheduled for three final assessments in one day, the assessment scheduled for the middle period shall be considered in conflict and the student shall notify the instructor no later than two weeks before the first day of the Final Examination Period. In such case, the final assessment in that course shall be given during the Conflict Examination Period or, by agreement of the instructor and the student, at a mutually satisfactory time.
    a. If the student notifies the instructor after the above deadline but before the first day of the Final Examination Period, the student shall, at the discretion of the instructor:
        i. receive a course grade of "I" (Incomplete), with an opportunity to take a makeup final assessment the following academic term (and have the course grade changed as warranted by the results of the test), or
        ii. be given the final assessment during the Conflict Examination Period or at an alternative time during the Final Examination Period, or
        iii. be given the final assessment at the time scheduled for the course.
    b. A student who fails to notify the instructor of the conflict before the first day of the Final Examination Period shall, at the discretion of the instructor:
        i. receive a score of zero on the final assessment, or
        ii. be given the final assessment during the Conflict Examination Period or at an alternative time during the Final Examination Period, or
        iii. be given the final assessment at the time scheduled for the course.
9. At the discretion of the instructor, students who arrive late, who exit the room without permission, or who are absent for an excessive period of time may forfeit their opportunity to complete the final assessment.
10. Students will have the full two hours and fifty minutes to complete the final, unless otherwise stated on the syllabus. Students must be notified in writing of any changes to the duration of the final exam before the withdrawal deadline.

XIII. Undergraduate Degrees

A. General

1. To be considered for admission to candidacy for a degree, a student must complete the Online Application for Graduation during the academic term preceding the term in which they will complete the degree requirements for their program.
2. A student who wishes to withdraw their name from the rolls of degree candidates must either notify the Office of the Registrar or their major academic advisor in writing to formally withdraw the Online Application for Graduation before the end of the seventh week of the semester (or fourth week of the summer term).
3. The diploma of a candidate for a degree shall bear the date of the commencement for which the degree is awarded.
4. All requirements for the degree must be completed and certified by the Registrar no later than 48 hours after Final Grade Submission Deadline of the academic term in which the candidate intends to graduate. If a candidate is not certified by the appropriate deadline, the candidate will be graduated at the next scheduled commencement. It is the responsibility of the student to reactivate the Online Application for Graduation for the appropriate term.
5. A degree program may include a maximum of four hours of basic ROTC and a maximum of six hours of advanced ROTC.

B. Residency Rule

No student may be considered a candidate for a degree unless the final 36 credit hours required for the degree are earned in residence at Georgia Tech and approved by the major school.

C. Ten-Year Rule

Work that was completed more than ten years prior to commencement must be validated by special examinations or evaluation by the appropriate academic unit before it can be counted toward a degree.

D. Requirements For a Bachelor's Degree

1. To be a candidate for a degree, undergraduate students must have passed or be enrolled in all courses required for the degree, must have a grade-point average for their entire academic program of at least 2.00, and must have done creditable work in their departmental courses so as to merit the recommendation for the degree by the chair and faculty of their school.

2. A bachelor's degree program must require at least 21 credit hours of upper division courses in the major field and at least 39 credit hours of upper division work overall.
3. A bachelor's degree program must require at least 120 credit hours, plus the Wellness Requirement, for a total of 122 credit hours.
4. A student, with the approval of their school or specialization, may satisfy the requirements for a bachelor's degree by meeting all of the requirements associated with any one curriculum year that has been in effect during their period of enrollment in the Institute (or that has been in effect during their last two years in the program at one of the Regents' Engineering Pathway Program (REPP) institutions, if their enrollment there occurred prior to their enrollment at Georgia Tech). A curriculum year is in effect for a student only if the student's date of matriculation is prior to the ending date of the Spring Semester concluding that curriculum year.
5. Constitution and History Requirements
   a. The Georgia law, as amended March 4, 1953, requires that before graduation all students pass examinations or pass comparable courses in United States and Georgia history and in the United States and Georgia Constitutions.
   b. See the Core Curriculum section of the Catalog for the methods by which the Constitution and History Requirements may be satisfied.
6. Regents' Exam
   - Since Spring 2010, the Regents' Exam has no longer required at Georgia Tech. To be considered a degree candidate, a student must complete an Online Application for Graduation during the term preceding the final term in residence.
7. Wellness Requirement
   a. Unless medically exempted, all students are required to satisfy the wellness requirement prior to graduation, as specified in the Core Curriculum section of the Catalog.
   b. The Health Information Record on file with the Director of Health Services will be used to determine any medical exemptions from the Wellness Requirement. All certificates of disability from personal physicians must be endorsed by the Director of Health Services.

E. Graduation with Academic Distinction

1. For graduation with highest honor, the minimum grade-point average (GPA) shall be 3.55.
   For graduation with high honor, the minimum grade-point average (GPA) shall be 3.35.
   For graduation with honor, the minimum grade-point average (GPA) shall be 3.15.
2. A student must have earned at least 60 semester credit hours (excluding remedial coursework) at Georgia Tech to graduate with highest honor, with high honor, or with honor.
3. In order to qualify for graduation with honors, all grades or grade corrections affecting the honors designation must be received and certified by the Office of the Registrar no later than noon on Wednesday following Commencement.
4. Tentative honors at graduation (recognized at Commencement) are determined by the grade-point average (GPA) entering the graduating term and the sum total of graded hours accumulated prior to the graduation term plus graded hours registered for and pending during the graduation term.

F. Earning More than One Undergraduate Degree

1. Students pursuing more than one undergraduate degree will remain classified as undergraduate students. Graduate students wishing to pursue additional undergraduate degrees will remain classified as graduate students. A graduate student, with approval of the major school, may work toward additional undergraduate degrees while pursuing a graduate degree.
2. To declare and be a candidate for more than one undergraduate degree, a student must submit an approved Change of Major form to the Registrar's Office.
3. To obtain more than one undergraduate degree, a student must complete all major required courses for the specific degree programs and earn credit for a total of at least 36 credit hours in excess of the requirement for any previous degrees earned. Students should work with their advisors to ensure the additional 36 hours for each additional undergraduate degree are not being counted multiple times across those degrees.
4. All items in Regulation XIII, "Undergraduate Degrees," apply to students completing more than one undergraduate degree.

G. Minors

1. A student may complete a minor in another academic field while completing the requirements of their major degree program.
2. With the approval of the major school, the student should consult an advisor in the minor field, who can inform the student of the requirements for the minor.
3. A Change of Undergraduate Minor Form must be completed, signed by the Minor Advisor/Coordinator and the Major Advisor, and submitted to Office of the Registrar. Students are encouraged to submit the completed form when they decide to pursue the minor but no later than the Deadline for the Online Application for Graduation in the academic term preceding anticipated graduation.
4. Students who change or add a minor must complete the requirements in the Catalog that was effective for the term in which the change or addition of a minor became official, or any subsequent edition of the Catalog.
5. A readmitted student who wishes to pursue a minor must indicate their choice on the Application for Readmission. Requirements for the minor are those in effect at the time the student is readmitted as stated in the current edition of the Catalog. The readmitted student may select only minors offered at the time of readmission.
6. Some courses in a minor may have prerequisites that are not included in the minor description. Some minors may have additional requirements that students must meet before being admitted to that minor.
7. The student must declare any minor(s) prior to applying for graduation. A Minor Program of Study Form signed by the major and minor advisor may be required depending on the minor. Minor requirements and information for a Minor Program of Study Form are located in DegreeWorks.
8. The minor will be conferred at the same time the degree is conferred.
9. Minors may not be conferred retroactively upon students who have graduated.
10. The minor will not be printed on the diploma, but both the degree and minor will be recorded on the student's transcript.
11. A student who has applied for a minor but does not wish to complete the minor must have their advisor contact the Office of the Registrar

for the minor to be removed prior to completing an Online Application for Graduation. Minors will be audited with the major and the status will be noted in DegreeWorks.

H. Undergraduate Students Taking Graduate Courses

See information about Undergraduate Students Taking Graduate Courses.

XIV. Graduate Degrees

The faculty of Georgia Tech grants stand-alone graduate certificates, master's degrees, and doctoral degrees. The goals for graduate education are to establish an educational environment that will strengthen students' personal and professional development, to encourage students and faculty to pursue the discovery and generation of new knowledge through research, to investigate ways of applying such knowledge for the benefit of society and humanity, and to foster the development of new tools, objects, and ideas.

Students whose interests and aptitudes lead them beyond the limits of the traditional undergraduate curriculum may broaden their knowledge of a given field and pursue independent inquiry through graduate study. A graduate education is of particular benefit to students interested in careers in research, management, development, design, or consulting; to those who aspire to formulate and administer policy; and to those who desire careers in higher education

A. Graduate Student Work Loads

Full-time students must be enrolled for at least 12 credit hours on a letter grade or pass/fail basis. As an exception, the advisor and school chair may allow up to three hours out of the minimum 12 to be taken on an audit basis in fall and spring semesters; in summer semesters, the advisor and school chair may allow up to six hours out of the 12 minimum to be taken on an audit basis. Hours in excess of the required 12 may be taken on any basis. Full-time students working exclusively on thesis research should be registered for 18 or more hours of 7000 or 9000 level courses (master's or doctoral thesis courses) in fall and spring semesters, and for up to 16 hours during summer semesters.

The maximum load for graduate students in good standing is 21 hours in fall/spring and 16 hours in summer. The minimum load is three hours, except for the semester of graduation. During the semester of graduation, a student is permitted to register for only one hour of master's or doctoral thesis courses (7000 or 9000). This exception may be used only once for each degree.

Students with fellowships, graduate research or teaching assistantships, traineeships, tuition waivers, or student visas, and those assigned to the Institute by the armed forces for the purpose of pursuing a degree are required to enroll full time. Part-time doctoral students engaged in research for their Ph.D.s should meet the minimum enrollment requirement and register for the number of 9000 level hours consistent with the time they and their faculty advisors spend on the dissertation research.

B. Graduate Policies and Regulations

The Institute Graduate Curriculum Committee, with the approval of the Academic Faculty Senate, is responsible for establishing academic policy for the graduate programs; however, final authority rests with the Senate. This committee reserves the right to change requirements for degrees as may be appropriate. Students enrolled at the time such changes appear in the catalog have the privilege of following either the regulations stated in the catalog effective the semester in which they enrolled or the regulations in the catalog that records the change.

This catalog records the Institute-wide policies and regulations that govern the graduate programs. Schools may make additional rules concerning their programs and the pursuit of their degrees, but such rules may not contradict Institute policies and regulations.

C. Transfer Credit

A student may not apply for transfer credit until after matriculation at Georgia Tech. The courses to be transferred would typically be those appearing on the approved program of study form for the master's degree. A doctoral student normally does not request transfer credit. The rules relative to and the process for obtaining transfer of credit for graduate-level courses are as follows:

1. Student's in a master's degree program requiring fewer than 33 semester credit hours may receive up to six hours of transfer credit for graduate-level courses taken at an institution accredited by a Canadian or U.S. regional accrediting board, or at a foreign school or university that has a signed partner agreement with Georgia Tech, and not used for credit toward another degree. This ensures completion of at least one-third of the courses for a degree in residence at Georgia Tech (applies to programs that are face-to-face and online format). A student in a master's degree program requiring 33 semester credit hours or more may receive up to nine hours of transfer credit for graduate-level courses taken at an institution accredited by a Canadian or U.S. regional accrediting board, or at a foreign school or university that has a signed partner agreement with Georgia Tech, and not used for credit toward another degree. This ensures completion of at least one-third of the courses for a degree in residence at Georgia Tech (applies to programs that are face-to-face and online format).The student must supply a current transcript for this evaluation.
2. To obtain transfer of credit, the student must complete the following procedure:
   a. The student will confer with the graduate advisor to ascertain whether the courses to be transferred are a logical part of the student's graduate program;
   b. If the courses are appropriate, the student will deliver to the school that teaches such courses a copy of the current transcript, necessary descriptive materials including catalog descriptions, and textbooks used for evaluation. The faculty of the appropriate school will determine the equivalent Georgia Tech course and the number of credit hours accepted. The faculty member who prepares the transfer credit form should have the school chair cosign it. The school should then send the form directly to the registrar with a copy of the student's Approved Program of Study attached;
   c. If the student wishes to transfer more than the number of hours permitted in item one listed above, a petition must be submitted to the Institute Graduate Curriculum Committee that includes statements of possible justification for the granting of such a petition, transfer credit forms, and the recommendation of the student's school chair.
3. A joint enrollment student may receive graduate credit for up to one-third of the hours required for the degree for graduate courses taken at Emory University or Georgia State University provided that the following is true:

a. Georgia Tech does not offer such courses;
b. The student's advisor and school chair approve the courses in advance and in writing;
c. The student passes the courses with a **C** or better. Advance approval is satisfied when the courses appear on the student's proposed Program of Study.

4. A student may not receive transfer credit from universities outside the United States and Canada unless the courses were taken at a foreign institution or university that is accredited by a Canadian or U.S. regional accrediting board or has a signed partner agreement with Georgia Tech. In any other case, an international student can obtain credit for courses previously taken but not applied toward another degree by filling out an Examination for Advanced Standing Authorization Request Form, paying the appropriate fee at the Bursar's Office, and passing the examination for advanced standing. The school or college that normally teaches the equivalent course will administer any necessary examinations.

D. Double Counting Credit between Master's Degrees

Students who are pursuing two master's degrees at Georgia Tech may double count a maximum of 6 hours of credit for both degrees. This ensures that each degree involves a minimum of 24 hours of coursework completed at Tech that is not double counted.

The six-hour limit may be exceeded when specifically allowed as a component of an approved degree program.

XV. Medical Regulations

A Medical Entrance Form and proof of required immunizations and tuberculosis screening must be on file with Stamps Health Services. Failure to provide this information may result in a health hold and delay of registration. All international students (F1 and J1 visas) are required to have health insurance coverage. Students may elect to purchase the health insurance made available by the health insurance provider contracted by Georgia Tech or may have their own comparable medical insurance.

A. Student Health Insurance

Source: Stamps Health Services

The Georgia Board of Regents (BOR) offers student health insurance for eligible students and their dependent(s). Two groups of students may purchase student health insurance: Mandatory and Voluntary. Mandatory students are required by the BOR to have student health insurance and the charge is applied automatically to the student's account along with tuition. A list of students who fall under the health insurance mandate can be found here: https://health.gatech.edu/sites/default/files/images/usg_mandatory_groups.pdf. Mandatory students who already have health insurance may apply to waive the Board of Regents (BOR) student health insurance coverage as long as their insurance coverage meets or exceeds the BOR insurance requirements.

There is an open enrollment period at the start of each semester to enroll or waive mandatory student insurance coverage, to enroll for the voluntary plan, or for enrolled mandatory students to add spouse/dependents coverage. For students and spouses with Board of Regents (BOR) student health insurance, Stamps Health Services (SHS) is the primary care provider. SHS renders care to students, spouses, and domestic partners. Dependent children are not eligible to be treated at SHS.

Note: The student health insurance is not the same as the Mandatory Student Health Fee. The Mandatory Student Health Fee is assessed per semester to all students taking 4+ credit hours. It is not health insurance and cannot be used outside of Stamps Health Services. Students cannot waive this fee. The Health fee covers most services at Stamps Health Services.

More information is available at www.health.gatech.edu and/or https://health.gatech.edu/finance/insurance.

B. Immunizations

Source: Stamps Health Services

All incoming students must comply with the Board of Regents of the University System of Georgia's immunization requirements. It is strongly recommended that immunization requirements are met as soon as possible to avoid a registration hold. A registration hold keeps students from registering for classes

Incoming students must use Stamps Health Services Immunizations Form.

More information is available at www.health.gatech.edu

XVI. Extracurricular Activities

A. Participation

1. In order to be eligible to participate in extracurricular activities, a student must satisfy the following requirements:
   a. be enrolled in a degree program (including students in official exchange programs as determined by the Office of International Education and as reported to the Registrar) and be registered;
   b. for Fall and Spring semesters, maintain a schedule with at least six credit hours on a for-credit basis or be a student registered with the Career Center on a work term
   c. all student organization officers must be enrolled in Georgia Tech classes with at least six credit hours on a for-credit basis or be a student registered with the Career Center on a work term in Atlanta
2. Changes in academic standing that affect eligibility become effective at the end of each academic term, usually the Tuesday following Final Examination Period.
3. Any student placed on Academic Drop/Dismissal or Review, or subject to finalized sanction(s) which include suspension or expulsion, is immediately ineligible for participation.
4. Changes in disciplinary standing that affect eligibility become effective immediately.
5. Participation also requires satisfaction of any additional requirements established by the Student Activities Committee of the Academic Senate.

B. Scheduling of Events

In each term, no student-sponsored extracurricular events can occur between the last day of classes and the end of the final exam period.

C. Student Organizations

1. All student organizations must adhere to the Student Organization Code of Conduct, the Student/Student Organization Alcohol Policy, and other policies set forth by the Division of Student Life.
2. Every organization must renew its charter every year or when changing officers by submitting an Officer Update Form and by signing the Alcohol Policy Acknowledgement Form.
3. Requirements and standards for chartering a student organization are established by the Student Activities Committee of the Academic Senate and are available from the Division of Student Life.

D. Fraternity and Sorority Regulations

1. To be eligible for initiation, a student must be a full-time student not on academic or disciplinary probation.
2. The initiation of any individual must be registered with and approved by the Division of Student Life prior to the initiation.
3. The individual must meet all Georgia Tech Interfraternity Council (IFC) or Panhellenic requirements concerning initiation.
4. All fraternities and sororities are subject to the rules established by the Georgia Tech IFC/Panhellenic/National Pan-Hellenic and all Georgia Tech policies, rules, and regulations.

E. Intercollegiate Athletics Regulations

1. To be eligible for intercollegiate athletic competition, a student must satisfy the following requirements:
   a. be eligible to participate in extracurricular activities, as defined in Regulation XVII, "Extracurricular Activities," Section A, "Participation";
   b. be carrying a full-time workload as defined in Regulation VI, "Scholastic Regulations," Section A, "Classification of Students," Item 3;
   c. for Summer semesters, be carrying an appropriate workload (3-16 hours) with the provision that the definition of full-time in Regulation VI, "Scholastic Regulations," Section A, "Classification of Students," Item 3 remains applicable;
   d. be making satisfactory progress toward a degree; and
   e. meet any further requirements of the NCAA or other governing organization; see the Athletic Director for details.
2. No student may be excused from regularly scheduled classes for athletic practice.
3. Special accommodations may be made (or coordinated) for intercollegiate student-athletes whose competition schedules conflict with the first week of reading periods and final exams.
4. No student may participate in more than two sports in intercollegiate competition in any school year, except by permission of the Division of Student Life. Being a manager or assistant manager is counted as participation within the meaning of this rule.

XVII. Academic Honor Code

Academic Honor Code

The Academic Honor Code is a student initiative that became an official Institute policy in 1996. The objective of the Academic Honor Code is to increase academic integrity and strengthen trust in the Georgia Tech community. All students are required to sign an agreement acknowledging their awareness of the Academic Honor Code. They are strongly encouraged to seek a full understanding of their instructors' expectations regarding academic honor.

The Academic Honor Code is available in the Georgia Tech Policy Library.

The Honor Agreement

"Having read the Georgia Institute of Technology Academic Honor Code, I understand and accept my responsibility as a member of the Georgia Tech community to uphold the Honor Code at all times. In addition, I understand my options for reporting honor violations as detailed in the Code."

XVIII. Code of Conduct

The official and most current versions of this policy document can be found in the Georgia Tech Policy Library and/or the Office of Student Integrity web site. In the event of any conflict, the document in the Policy Library and/or on the OSI web site shall govern.

- Student Code of Conduct

Additional policy documents are available in the Georgia Tech Policy Library.

- Academic Honor Code
- Student Organizations Code of Conduct
- Student/Student Organization Alcohol Policy
- Student Sexual Misconduct Policy

XIX. Grievance Procedures

These procedures are intended to provide students at Georgia Tech a means for setting forth grievances relating to assessment activities that contribute toward satisfaction of graduation requirements. Disputes that can be contested under these Grievance Procedures include, but are not limited to: final course grades, PhD qualifying or comprehensive exams, and PhD defenses. It is not the intention of these procedures to provide a forum for questioning the judgment or grading policies of faculty. A student's concerns may be discussed with a faculty member and/or reported to the school or department head, the academic deans, or the Associate Vice Provost for Advocacy and Conflict Resolution.

These Grievance Procedures may not be used to challenge or appeal the outcome of an Academic Misconduct case adjudicated under the Academic Honor Code. The Academic Honor Code and the rules governing Academic Misconduct procedures can be found in the Policy Library at: http://www.policylibrary.gatech.edu/student-affairs/academichonor-code, http://www.policylibrary.gatech.edu/student-life/academic-misconduct.

A. Deadlines for Submitting a Grievance

1. Students must submit a formal grievance within their next enrolled academic term following the academic term of the course or examination in question, and best efforts should be applied to resolve the appeal within that academic term.

2. Students who have been placed on academic dismissal or who have graduated may also use these grievance procedures. The deadline to submit a formal grievance for these students is within the next term after the grade was earned or the examination result was provided to the student. For example, a student who earned the grade in the Fall term would have to initiate the formal grievance process in the following Spring term. A student who earned the grade in the

Spring term would have to initiate the formal grievance process in the following Summer term.

B. Steps in the Grievance Process*

**The steps of the grievance process must followed in the order presented below.*

1. The student should attempt to informally resolve the grievance with the individual faculty member or the academic unit involved, where a unit is defined as a school, department or college (if the college has no schools or departments).
2. If the grievance is not resolved in Step B.1 and the student elects to initiate a formal grievance process, the student may request a hearing by setting forth in writing the complaint and the remedy sought at the unit level. Upon receipt of this document, the unit head will acknowledge the formal grievance in writing within seven calendar days and will expeditiously proceed to constitute an ad hoc grievance committee. The unit head will serve as a nonvoting member of the committee. In addition, the following four committee members will be selected:
   a. One tenured faculty member from within the unit, selected by the unit head.
   b. One member of the academic faculty, selected by the student. The student may elect not to select a faculty member; in that case, the committee will consist of three members.
   c. One member from outside the unit, selected by the Student Grievance and Appeal Committee in consultation with the unit head.
   d. One member of the academic faculty selected by the faculty member or faculty committee whose action is in question.
   The Committee will proceed with due haste to examine the merits of the complaint and to render a decision within 30 days. During the proceedings, the student may present any and all evidence that the student deems necessary to support the complaint, except that the Committee must agree that the evidence is in some way relevant. Such evidence may consist of documentation and/or testimony. Both the student grievant and respondent(s) may be accompanied by advisors; the role of advisor must, however, be restricted to advice. Grievant(s) and respondent(s) must make their own cases before the committee.
   Following a hearing and a written decision at the school, college, or unit level, the grievance is presumed to be resolved unless the grievant appeals.
3. The grievant may appeal the decision that has been rendered by the unit to the Student Grievance and Appeal Committee.
   a. If the Committee, or subset thereof appointed by the chairperson of the Student Grievance and Appeal Committee, rules that the procedures are not applicable or that based on the facts stated by the grievant viewed in the light most favorable to the grievant, there is no basis for relief, then the appeal is denied,
   b. If the Committee rules that the grievance procedural rules are applicable and that a hearing of the appeal is warranted, the Committee shall initiate a hearing process.
   c. If a student wishes to have a grievance outcome reviewed by the Student Grievance and Appeal Committee with a view to a formal hearing, the student shall observe the following requirements:
      i. The appeal must be in writing. It must state the basis for the grievance and the facts that support it, including a summary of the steps that have already been taken to resolve the grievance, reasons why the student finds the resolutions unfair or unsatisfactory, and a statement of the desired remedy.
      ii. The written appeal must be presented to the chairperson of the Student Grievance and Appeal Committee within thirty days after the student has received notice of a decision from the unit.
      iii. The decision as to whether a formal hearing is warranted shall be made available, in writing, to the parties concerned within thirty days after the Committee has received notice of the appeal.
      iv. The Committee may alter a deadline specified in these procedures on written petition of either party showing a meritorious reason for delay; if the Committee itself needs to extend a deadline, it may do so on its own authority for periods up to fourteen calendar days; for longer delays, the Committee must request an extension from the Executive Board of the Institute.
      v. The determination of the Committee as to whether a hearing is warranted is final.
      vi. The Committee shall develop and, with the approval of the Academic Senate, establish and publish its own rules of procedures for the conduct of formal hearings.
      vii. After receiving testimony and the relevant documents, the Committee shall make a decision within thirty days on the basis of the received material.
      viii. The Committee's decision shall contain finding of fact, the decision arrived at, reasons for the decision, and the criteria or policy applied in reaching the decision.

C. Remedies

1. **General**
   If the Committee finds, after a formal hearing, that a faculty member, a unit committee, or an administrator of a unit has not acted fairly or properly, it will recommend a remedy. It will seek to find a remedy that can be implemented by those whose cooperation is needed. In the matter of a grade dispute, this must include the faculty member involved in the dispute.

2. **Enforcement**

   a. If any party does not comply with the decision of the Committee, the Committee shall, upon request of any party, seek full compliance through the administrative offices of the Institute through the Chief Academic Officer (CAO).
   b. The merits of the dispute shall not be subject to review in the process of enforcement. There shall be strong presumption in favor of the remedy selected by the Committee.

3. **Report of a Final Decision**
   After a final decision has been made in a case, the Committee shall prepare a report setting forth its findings and recommendations for action and present the report to the CAO. A copy of the report shall be presented to the parties concerned and to those persons involved in implementing the Committee's recommendations. All such communications shall be effected in person or by certified mail with a return receipt requested; such receipt will become part of the Institute records of the case.
   Care will be given that no incomplete or inaccurate information pertaining to the grievance is placed in any file and that all evidence obtained at any stage of the process and all deliberations and

proceedings be kept confidential. At the conclusion of each case, the Student Grievance and Appeal Committee shall transmit original or true copies of the documents related to the case to the appropriate Office of the Dean of Students, who shall keep such records securely as Institute records for a period of time specified by Institute statutes.

a. **Grade Changes:**
In decisions that would result in the changing of a posted grade, the CAO will instruct the unit director to ask the involved faculty member to effect the prescribed grade change or, if cooperation is not forthcoming, to effect the grade change directly by action of the unit director. Such action shall not be construed as restrictive of the resources of the faculty member through the usual appeal procedure of the Institute.

4. **Final Appeal**
Appeal of the decision of the Committee to the CAO shall be permitted only for the purposes of procedural review. Such appeals shall be submitted in writing, with copies to the Committee. The CAO will review the findings of the Committee and, upon judgment that the Committee has failed to follow these procedures or has failed to follow the procedures approved by the Academic Senate for the operation of the Student Grievance and Appeal Committee (XX1.C.3.c.c6), return the case to the Committee for reconsideration, along with description of the received error in procedure and a recommendation for its correction.

XX. Exceptions

Where appeals are not otherwise specified, exceptions to these regulations may be made by the appropriate faculty committee upon petition by the student and recommendation of the student's school or department. Blanket exceptions that have the effect of amending these regulations shall be referred to the Academic Senate for approval.

XXI. Student-Faculty Expectations

Additional information is available regarding Graduate Student-Advisor Expectations. Read more

A. Preamble

The Georgia Tech community believes that it is important to continually strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. Therefore, we herein endeavors to enumerate the specific expectations of each side. However, this document is not intended to be either comprehensive or limiting in regards to the Institute's statutes. Ultimately, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. We remain committed to the ideals of Georgia Tech, agree to abide by these principles in our time here, and will encourage each other to uphold these responsibilities.

B. Student Expectations

We hold that all students have the right to expect:

1. a positive, respectful, and engaged academic environment inside and outside the classroom;
2. to attend classes at regularly scheduled times without undue variations and without penalty if the student cannot attend instructional, lab, or examination hours not institutionally scheduled;
to have their instructor of record be present during most scheduled lecture periods.
3. to receive a syllabus which should include an outline of the course objectives, evaluation criteria, and any other requirements for successful completion of each course during the first week of class meetings and to be clearly informed of any changes made to the syllabus during the semester with reasonable time to adjust to these changes;
4. to consult with faculty outside of usual classroom times through regularly scheduled office hours or a mutually convenient appointment;
5. to have reasonable access to Institute facilities and equipment in order to complete course assignments and/or objectives;
6. to have reasonable time to learn course material prior to the administration of an examination;
7. to receive a clear explanation of the faculty's definition and interpretation of academic misconduct within the course that extends over and beyond those clearly defined in the Georgia Tech Honor Code;
8. to have reasonable access to graded materials for assignments, projects, or exams, to review graded material in a timely fashion, and to have a clear explanation of grading criteria and grade determination;
9. to have their letter grade in a class based on their performance based on course criteria and not solely on their performance relative to their classmates;
10. faculty to adhere to formal Institute policies, rules and regulations, such as the policy on Final Instructional Class Days and Reading Periods, and the confidentiality policies of FERPA.
11. faculty to be supportive of students' desires and needs to find rewarding careers after graduation from Georgia Tech. Faculty should be flexible in allowing students to attend the Georgia Tech All Majors Career Fair that occurs in the Fall and Spring Semesters and should refrain when possible from scheduling quizzes or tests on those days;
12. faculty to be flexible during the semester when students have off campus interviews for jobs or graduate/professional schools and should allow students to make up missed work when possible.
13. to be allowed to make up course assignments that were due prior to the student's addition of that course during Phase II registration.

C. Faculty Expectations

We hold that all faculty members have the right to expect:

1. a positive, respectful, and engaged academic environment inside and outside the classroom;
2. students to appear regularly for class meetings in a timely fashion;
3. to select qualified Teaching Assistants in accordance with departmental protocols as well as the right to delegate grading, studio and laboratory instruction, tutoring, and other academic activities to these individuals;
4. students to appear at office hours or a mutually convenient appointment for official matters of academic concern;
5. full attendance at examination, midterms, presentations, studios, and laboratories, with the exception of formal pre-approved excused absences or emergency situations;
6. students to be prepared for class, appearing with appropriate materials and having completed assigned readings and homework;

7. full engagement within the classroom, including meaningful focus during lectures, appropriate and relevant questions, and class participation;
8. to cancel class due to emergency situations and to cover missed material during subsequent class meeting times at the discretion of the instructor;
9. students to act with integrity and to adhere to the principles of the Georgia Tech Student Honor Code;
10. students to adhere to the formal Institute policies, such as the Student Code of Conduct.
11. students to make every effort to minimize their absences from scheduled lectures, laboratories, and studios during the Georgia Tech All Majors Career Fair that occurs in the Fall and Spring Semesters, and to notify them in advance if they intend to miss class to attend the Georgia Tech All Majors Career Fair;
12. students to notify them as soon as possible when they have off campus interviews for jobs or graduate/professional schools that conflict with class attendance.
13. students would be responsible for obtaining and completing any missed assignments or material in a timely manner when they add a course during Phase II registration after the first class meeting.

PROGRAMS

- Aerospace Engineering. Minor, BS, MS, PhD
- African Studies. Minor
- Air Force Leadership Studies. Minor
- Algorithms, Combinatorics, and Optimization. PhD
- Analytics. MS
- Applied Languages and Intercultural Studies. BS, MS
- Applied Physics. BS
- Applied Physiology. PhD
- Applied Systems Engineering. PMASE
- Architecture. Minor, BS, M.Arch, MS, PhD
- Atmospheric and Oceanic Sciences. BS
- Biochemistry. BS
- Bioengineering. MS, PhD
- Bioinformatics. MS, PhD
- Biology. Minor, BS, MS, PhD
- Biomedical Engineering. Minor, BS, MS, PhD
- Biomedical Innovation and Development. MBID
- Black Media Studies. Minor
- Building Construction. BS, PhD
- Building Construction and Facility Management. MS
- Business Administration. BS, MBA.
- Business Administration - Global Business. MBA.
- Business Administration - Management of Technology. MBA.
- Chemical and Biomolecular Engineering. BS
- Chemical Engineering. MS, PhD
- Chemistry. BS, MS, PhD
- Chemistry and Biochemistry. Minor
- Chinese. Minor
- City and Regional Planning. MCRP, PhD
- Civil Engineering. BS, MS, PhD
- Computational Data Analysis. Minor
- Computational Media. BS
- Computational Science and Engineering. MS, PhD
- Computer Engineering. BS
- Computer Science. BS, MS, PhD
- Computing and Business. Minor
- Computing and Devices. Minor
- Computing and Information Internetworks. Minor
- Computing and Intelligence. Minor
- Computing and Media. Minor
- Computing and People. Minor
- Computing and Systems and Architecture. Minor
- Computing and Theory. Minor
- Cybersecurity. MS
- Digital Media. MS, PhD
- Earth and Atmospheric Sciences. Minor, BS, MS, PhD
- East Asian Studies. Minor
- Economics. Minor, BS, MS, PhD
- Economics and International Affairs. BS
- Electrical and Computer Engineering. MS, PhD
- Electrical Engineering. BS
- Energy Systems. Minor
- Engineering and Business. Minor
- Engineering Science and Mechanics. MS, PhD
- Environmental Engineering. BS, MS, PhD
- Environmental Science. BS
- European Studies. Minor
- Film and Media Studies. Minor
- French. Minor
- Geographic Information Science and Technology. MS
- German. Minor
- Global Development. Minor, MS
- Global Economics and Modern Languages. BS
- Health and Medical Sciences. Minor
- Health, Medicine, and Society. Minor
- Health Policy and Economics. Minor
- Health Systems. MS
- History. Minor
- History and Sociology of Technology and Science. MS, PhD
- History, Technology, and Society. BS
- Human-Centered Computing. PhD
- Human-Computer Interaction. MS
- Industrial Design. Minor, BS, M.ID
- Industrial Engineering. BS, MS, PhD
- International Affairs. Minor, BS, MS
- International Affairs and Modern Language. BS
- International Affairs, Science, and Technology. MS, PhD
- International Business, Language, and Culture. Minor
- International Security. MS
- Japanese. Minor
- Korean. Minor
- Latin American/LatinX Studies. Minor
- Law, Science, and Technology. Minor
- Leadership Studies. Minor
- Linguistics. Minor
- Literature, Media, and Communication. BS
- Machine Learning. PhD
- Management. MS, PhD.
- Manufacturing Leadership. PMML
- Materials Science and Engineering. Minor, BS, MS, PhD
- Mathematics. Minor, BS, MS, PhD
- Mechanical Engineering. BS, MS, MS (undesignated), PhD
- Medical Physics. MS
- Microeconomics of Strategic Analysis. Minor
- Middle Eastern and North African Studies. Minor
- Music Technology. BS, MS, PhD
- Naval Science. Minor
- Nuclear Engineering. MS, PhD
- Nuclear and Radiological Engineering. Minor, BS
- Neuroscience. BS
- Ocean Science and Engineering. PhD
- Operations Research. MS, PhD

- Occupational Safety and Health. PMOSH
- Philosophy. Minor
- Physics. Minor, BS, MS, PhD
- Physiology. Minor
- Political Science. Minor
- Psychology. Minor, BS, MS, PhD
- Public Policy. Minor, BS, MS, PhD
- Quantitative Biosciences. PhD
- Quantitative and Computational Finance. MS
- Real Estate Development. MRED
- Robotics. Minor, MS, PhD
- Russian. Minor
- Science Fiction Studies. Minor
- Science of Mental Health and Well-Being. Minor
- Science, Technology, and Society. Minor
- Scientific and Engineering Computing. Minor
- Social Justice. Minor
- Sociology. Minor
- Solid Earth and Planetary Sciences. BS
- Spanish. Minor
- Sports, Society, and Technology. Minor
- Statistics. MS
- Supply Chain Engineering. MS
- Sustainable Cities. Minor
- Sustainable Development and Construction. Minor
- Sustainable Electrical Energy. PMSEE
- Sustainable Energy and Environmental Management. MSEEM
- Technology and Business. Minor
- Urban Analytics. MS
- Urban Design. MS
- Women, Science, and Technology. Minor

- Aerospace Engineering. Minor
- African Studies. Minor
- Air Force Leadership Studies. Minor
- Architecture. Minor
- Biology. Minor
- Biomedical Engineering. Minor
- Black Media Studies. Minor
- Chemistry and Biochemistry. Minor
- Chinese. Minor
- Computational Data Analysis. Minor
- Computing and Business. Minor
- Computing and Devices. Minor
- Computing and Information Internetworks. Minor
- Computing and Intelligence. Minor
- Computing and Media. Minor
- Computing and People. Minor
- Computing and Systems and Architecture. Minor
- Computing and Theory. Minor
- Earth and Atmospheric Sciences. Minor
- East Asian Studies. Minor
- Economics. Minor
- Energy Systems. Minor
- Engineering and Business. Minor
- European Studies. Minor
- Film and Media Studies. Minor
- French. Minor
- German. Minor
- Global Development. Minor
- Health and Medical Sciences. Minor
- Health, Medicine, and Society. Minor
- Health Policy and Economics. Minor
- History. Minor
- Industrial Design. Minor
- International Affairs. Minor
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- Korean. Minor
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- Middle Eastern and North African Studies. Minor
- Naval Science. Minor
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- Women, Science, and Technology. Minor

- Aerospace Engineering. BS
- Applied Languages & Intercultural Studies. BS
- Applied Physics. BS
- Architecture. BS
- Atmospheric and Oceanic Sciences. BS

- Biochemistry. BS
- Biology. BS
- Biomedical Engineering. BS
- Building Construction. BS
- Business Administration. BS
- Chemistry. BS
- Chemical and Biomolecular Engineering. BS
- Civil Engineering. BS
- Computational Media. BS
- Computer Engineering. BS
- Computer Science. BS
- Earth and Atmospheric Sciences. BS
- Economics. BS
- Economics and International Affairs. BS
- Electrical Engineering. BS
- Environmental Engineering. BS
- Environmental Science. BS
- Global Economics and Modern Languages. BS
- History, Technology, and Society. BS
- Industrial Design. BS
- Industrial Engineering. BS
- International Affairs. BS
- International Affairs and Modern Language. BS
- Literature, Media, and Communication. BS
- Mathematics. BS
- Materials Science and Engineering. BS
- Mechanical Engineering. BS
- Music Technology. BS
- Neuroscience. BS
- Nuclear and Radiological Engineering. BS
- Physics. BS
- Psychology. BS
- Public Policy. BS
- Solid Earth and Planetary Sciences. BS

- Aerospace Engineering. MS
- Analytics. MS
- Applied Languages and Intercultural Studies. MS
- Applied Systems Engineering. PMASE
- Architecture. M.Arch, MS
- Bioengineering. MS
- Bioinformatics. MS
- Biomedical Engineering. MS
- Biology. MS
- Biomedical Innovation and Development. MBID
- Building Construction and Facility Management. MS
- Business Administration. MBA.
- Business Administration - Global Business. MBA.
- Business Administration - Management of Technology. MBA.
- Chemical Engineering. MS
- Chemistry. MS
- City and Regional Planning. MCRP
- Civil Engineering. MS
- Computational Science and Engineering. MS
- Computer Science. MS
- Cybersecurity. MS
- Digital Media. MS
- Earth and Atmospheric Sciences. MS
- Economics. MS
- Electrical and Computer Engineering. MS
- Engineering Science and Mechanics. MS
- Environmental Engineering. MS
- Geographic Information Science and Technology. MS
- Global Development. MS
- Health Systems. MS
- History and Sociology of Technology and Science. MS
- Human-Computer Interaction. MS
- Industrial Design. M.ID
- Industrial Engineering. MS
- International Affairs. MS
- International Affairs Science and Technology. MS
- International Security. MS
- Management. MS
- Manufacturing Leadership. PMML
- Materials Science and Engineering. MS
- Mathematics. MS
- Mechanical Engineering. MS, MS (undesignated)
- Medical Physics. MS
- Music Technology. MS
- Nuclear Engineering. MS
- Operations Research. MS
- Occupational Safety and Health. PMOSH
- Physics. MS
- Psychology. MS
- Public Policy. MS
- Quantitative and Computational Finance. MS
- Real Estate Development. MRED
- Robotics. MS
- Statistics. MS
- Supply Chain Engineering. MS
- Sustainable Electrical Energy. PMSEE
- Sustainable Energy and Environmental Management. MSEEM
- Urban Analytics. MS
- Urban Design. MS

- Aerospace Engineering. PhD
- Algorithms, Combinatorics, and Optimization. PhD
- Applied Physiology. PhD
- Architecture. PhD
- Bioengineering. PhD
- Bioinformatics. PhD
- Biology. PhD
- Biomedical Engineering. PhD
- Building Construction. PhD
- Chemical Engineering. PhD
- Chemistry. PhD

- City and Regional Planning. PhD
- Civil Engineering. PhD
- Computational Science and Engineering. PhD
- Computer Science. PhD
- Digital Media. PhD
- Earth and Atmospheric Sciences. PhD
- Economics. PhD
- Electrical and Computer Engineering. PhD
- Engineering Science and Mechanics. PhD
- Environmental Engineering. PhD
- History and Sociology of Technology and Science. PhD
- Human-Centered Computing. PhD
- Industrial Engineering. PhD
- International Affairs, Science, and Technology. PhD
- Machine Learning. PhD
- Management. PhD.
- Materials Science and Engineering. PhD
- Mathematics. PhD
- Mechanical Engineering. PhD
- Music Technology. PhD
- Nuclear Engineering. PhD
- Ocean Science and Engineering. PhD
- Operations Research. PhD
- Physics. PhD
- Psychology. PhD
- Public Policy.PhD
- Quantitative Biosciences. PhD
- Robotics. PhD

Georgia Institute of Technology offers three types of Certificates:
Undergraduate Embedded

Undergraduate embedded certificates are intended to encourage students to use the elective course requirements in their degree program to form a coherent package of coursework in a specified area.

Undergraduate embedded certificates will be granted only to students who, in addition to the undergraduate embedded certificate program requirements, have satisfied requirements for an undergraduate degree. The offering unit is responsible for verifying satisfaction of all undergraduate embedded certificate requirements, as well as completion of an undergraduate degree. Undergraduate embedded certificates are not recorded on the student's transcript or diploma. Arrangements must be made for awarding undergraduate embedded certificates within colleges or offering units. Undergraduate embedded certificates will not be awarded at the Institute level.

Undergraduate Certificate Guidelines

Graduate Embedded

Graduate embedded certificates are intended to encourage students to use the elective course requirements in their degree program to form a coherent package of coursework in a specified area.

Graduate embedded certificates will be granted only to students who, in addition to the graduate embedded certificate program requirements, have satisfied requirements for a graduate degree. The offering unit is responsible for verifying satisfaction of all graduate embedded certificate requirements, as well as completion of a graduate degree. Graduate embedded certificates are not recorded on the student's transcript or diploma. Arrangements must be made for awarding graduate embedded certificates within colleges or offering units. Graduate embedded certificates will not be awarded at the Institute level.

Graduate Embedded Certificate Guidelines

Graduate Stand-Alone

Stand-alone certificates may be completed independent of students being enrolled as Master's or Doctoral student. These certificates represent a cohesive program of study of a smaller size than a Master's program and provide more flexibility to professionals for pursing graduate education, including a means for professionals to renew and retrain due to a fast-changing work force. When completed, these certificates appear on the student's academic record (transcript), and the student receives a certificate of completion.

Graduate Stand-Alone Certificate Guidelines

Undergraduate Embedded Certificates

- Accounting. Undergraduate Certificate
- African American Studies. Undergraduate Certificate
- Architecture and Society. Undergraduate Certificate
- Asian Affairs. Undergraduate Certificate
- Astrophysics. Undergraduate Certificate
- Business Analytics. Undergraduate Certificate
- Business Law and Ethics. Undergraduate Certificate
- Cellular and Molecular Biosciences. Undergraduate Certificate
- Chinese. Undergraduate Certificate
- Computational Design. Undergraduate Certificate
- Construction Management. Undergraduate Certificate
- Ecology, Evolution, and Conservation Biology. Undergraduate Certificate
- Economics. Undergraduate Certificate
- Entrepreneurship. Undergraduate Certificate
- European Affairs. Undergraduate Certificate
- Finance. Undergraduate Certificate
- French. Undergraduate Certificate
- Genetics, Genomics, and Bioinformatics. Undergraduate Certificate
- German. Undergraduate Certificate
- History. Undergraduate Certificate
- Information Technology Management. Undergraduate Certificate
- Intellectual Property. Undergraduate Certificate
- International Business. Undergraduate Certificate
- Japanese. Undergraduate Certificate
- Latin American Affairs. Undergraduate Certificate
- Leadership and Organizational Change. Undergraduate Certificate
- Linguistics. Undergraduate Certificate
- Marketing. Undergraduate Certificate
- Microbial Systems. Undergraduate Certificate
- Nuclear and Radiological Engineering. Undergraduate Certificate
- Operations and Supply Chain Management. Undergraduate Certificate
- Philosophy. Undergraduate Certificate
- Physics of Living Systems. Undergraduate Certificate
- Physiology and Biomedical Sciences. Undergraduate Certificate

- Pre-Law. Undergraduate Certificate
- Political Science. Undergraduate Certificate
- Public Policy. Undergraduate Certificate
- Pulp & Paper. Undergraduate Certificate
- Real Estate Development. Undergraduate Certificate
- Russian. Undergraduate Certificate
- Scenarios, Models and Military Games. Undergraduate Certificate
- Sociology. Undergraduate Certificate
- Software Engineering. Undergraduate Certificate
- Spanish. Undergraduate Certificate
- Special Studies in Biological Sciences. Undergraduate Certificate
- Strategy & Innovation. Undergraduate Certificate
- Sustainable Architecture. Undergraduate Certificate
- Sustainable Business. Undergraduate Certificate

Graduate Embedded Certificates

- Astrobiology. Graduate Certificate
- BioRobotics. Graduate Certificate
- Computational Materials Science and Engineering. Graduate Certificate
- Geographic Information Systems. Graduate Certificate
- Industrial Design Fundamentals. Graduate Certificate
- Mechanical Properties of Materials. Graduate Certificate
- Micro Electro Mechanical Systems. Graduate Certificate
- Public Policy. Graduate Certificate
- Remote Sensing. Graduate Certificate
- Science, Technology, and Society. Graduate Certificate
- Space Entrepreneurship. Graduate Certificate

Graduate Stand-Alone Certificates

- Business Analytics. Graduate Certificate
- Data Science for the Chemical Industry. Graduate Certificate
- Emerging Technologies and Proliferation. Graduate Certificate
- Global Development. Graduate Certificate
- International Security and Aerospace Systems. Graduate Certificate
- Medical Physics. Graduate Certificate
- Sustainable Energy and Environmental Management. Graduate Certificate

Once graduate stand-alone certificate programs are approved by the Institute, they will be listed here.

BACHELOR OF SCIENCE IN AEROSPACE ENGINEERING

The first year focuses on coursework in the areas of chemistry, mathematics, physics, humanities, social sciences. The second year adds coursework in general engineering sciences and aerospace specific disciplines. The third and fourth years emphasize aerospace disciplines, vehicle systems integration and design, and Options courses that allow students to individualize their education.The undergraduate curriculum is designed to provide each student with a general background for employment in industry or government, or advanced study in graduate school at the end of four years. The program stresses the analytical, experimental, and design aspects of aerospace engineering. A certain degree of specialization is available to undergraduate students through the proper choice of Options and through a choice of air- or space-focused tracks. In addition, opportunities for undergraduate research and team competition courses are available, depending on the student's abilities and career objectives. Courses do not have to be taken during the specific semester indicated in the curriculum, but all prerequisites must be satisfied for each course. Advisement is encouraged before registration, with each student assigned a faculty advisor who remains the same for the full undergraduate program, unless the student requests a change. Students should consult with academic advisors for the availability of courses and recommended course sequences.

Program Educational Objectives

The undergraduate aerospace engineering degree program is designed to achieve the following objectives:

- Our graduates will be technically proficient and effective leaders and entrepreneurs. They will display high professional and ethical standards in aerospace engineering and related fields, and within industry, academia, and government.
- Our graduates will create new knowledge and engineering practices and develop products and services that have a global impact. They will collaborate with international partners and engage in culturally diverse teams.
- Our graduates will be life-long learners, continually developing their leadership, critical thinking, and problem-solving skills. They will be actively engaged in the acquisition and advancement of knowledge and technical expertise through research and development, and through active participation in professional societies, graduate studies, conferences, and symposia.
- Our graduates will transfer the knowledge gained from their aerospace engineering degrees to new fields that intersect with aerospace engineering such as robotics, medicine, and clean energy. They will use their degrees as a launching point for careers in other professional fields such as law, medicine, and public service.

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [1]	4
Core B - Institutional Options		
CS 1371	Computing for Engineers	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [1,2]	4
PHYS 2212	Introductory Physics II [1,3]	4
MATH 1551	Differential Calculus [1]	2
MATH 1553	Introduction to Linear Algebra [1,7]	2
Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus [1]	4
MATH 2552	Differential Equations [1]	4
MSE 2001	Principles and Applications of Engineering Materials	3
CHEM 1310	Principles of General Chemistry for Engineers	4
AE 1601	Introduction to Aerospace Engineering [1]	1
COE 2001	Statics [1]	2
Major Requirements		
AE 2010	Thermodynamics & Fluids Fundamentals [1]	4
AE 2220	Dynamics [1]	3
COE 3001	Mechanics of Deformable Bodies	3
AE 2610	Introduction to Experimental Methods in Aerospace	1
AE 2611	Technical Communications for Aerospace Engineers [1]	1
AE 3330	Introduction to Aerospace Vehicle Performance	3
AE 3030	Aerodynamics	4
AE 3140	Structural Analysis	3
AE 3530	System Dynamics and Vibration	3
AE 3531	Control System Analysis and Design	3
AE 3610	Experiments in Fluid and Solid Mechanics	2
AE 4311	Aircraft Design I: Conceptual Design	3
or AE 4321	Space System Design I: Conceptual Design	
or AE 4331	Rotorcraft Design I: Conceptual Design	
AE 4312	Aircraft Design II: Preliminary Design	3
or AE 4322	Space System Design II: Mission Design	
or AE 4332	Rotorcraft Design II: Preliminary Design	

AE 4531	Aircraft Flight Dynamics	3
or AE 4532	Spacecraft Flight Dynamics	
AE 4451	Jet and Rocket Propulsion	3
AE 4610	Dynamics and Control Laboratory	2
AE Options [4]		6
Non-AE Required Courses		
ME 1670	Introduction to Engineering Graphics and Design	3
ECE 3710	Circuits and Electronics	2
ECE 3741	Instrumentation and Electronics Lab	1
Math Option [5]		3
Free Electives		
Free Electives [6]		9
Total Credit Hours		**131**

Pass-fail only allowed for Free Electives.

1 Minimum grade of C required.
2 If PHYS 2231 (5 credit hours) is taken, excess hour applies to Free Electives.
3 If PHYS 2232 (5 credit hours) is taken, excess hour applies to Free Electives.
4 AE courses from list supplied by School
5 Math Options: MATH 3215, MATH 3670, MATH 4305, MATH 4317, MATH 4320, MATH 4347, MATH 4541, MATH 4581, MATH 4640
6 ME 2202, ME 3322, and PHYS 2XXX (AP credit) are not allowed.
7 MATH 1554 or MATH 1564 may be used in place of MATH 1553.

- A grade of **C** or better is required in each 1000 and 2000 level mathematics and physics course; a course with a **D** or **F** grade must be repeated the next semester the student is in residence.
- A 2.0 or higher overall grade-point average is required to schedule COE 2001
- At the 3000-level and above, no more than two D grades are permitted in required AE (core and AE options) and required COE courses. Additional D grades must be repeated.

Cooperative Plan

The School of Aerospace Engineering offers BSAE with COOP option. Students alternate between industrial assignments and classroom studies until they complete three semesters of work. Co-op students with mechanical engineering majors complete the same coursework on campus that is completed by regular four-year students. Most co-op students begin the program as sophomores or juniors and are classified as full-time students regardless of whether they are attending classes on campus or are full-time at an employer's location. For additional information about the Georgia Tech Co-Op program, visit www.coop.gatech.edu.

International Plan

The International Plan is a challenging and coherent academic program for undergraduates emphasizing global competence within the context of the aerospace engineering major. This program has specific language requirements. There are also coursework requirements related to history, global economy, international culture, and residential foreign experience. Refer to www.internationalplan.gatech.edu for the general requirements of the International Plan. These requirements may be satisfied by carefully selecting the humanities, social sciences, and free elective hours available in the program, in consultation with a faculty advisor.

Research Option

The school of Aerospace Engineering offers the "Research Option" under the BSAE degree program. In order to graduate with a BSAE (RO) degree, the students must

- Complete at least nine units of undergraduate research (over at least two, preferably three terms). Research may be for either pay (AE 2698 or AE 4698) or credit (AE 2699 or AE 4699). Research for credit may be used towards the BSAE free elective requirements.
- Write an undergraduate thesis/report of research on their findings. This is usually done during the graduating term.
- Take both LMC 4701 (typically taken during the first or second semester of research) and LMC 4702: (taken during the thesis-writing semester).

At least six of the nine required credit hours of research should be on the same topic. A research proposal must be approved by a faculty advisor and one other faculty member. This proposal will be written in LMC 4701 which serves as a prerequisite for LMC 4702. Completion of Research Option is noted on the student's transcript.

For additional details, please contact: permits@ae.gatech.edu

BS/MS Honors Program

A combined BS/MS honors program is also offered that prepares students for graduate studies and research. Please see http://ae.gatech.edu/bs-ms-honors-program for more information.

BACHELOR OF SCIENCE IN APPLIED LANGUAGES & INTERCULTURAL STUDIES

The School of Modern Languages offers a Bachelor of Science degree in Applied Languages and Intercultural Studies (ALIS) with separate language concentrations in Chinese, French, German, Japanese, Korean, Russian, and Spanish. The B.S. in Applied Languages and Intercultural Studies equips students with 21st-century foreign language study and expertise that acknowledges a rapidly globalizing world.

The B.S. in ALIS is more than language study. As an international institution located in the global hub that is Atlanta, Georgia Tech sits at the intersection of global culture and innovation. Our degree recognizes that it is no longer enough to learn a new language if it is not accompanied with applicable skills for emerging industries, real-world problem-solving, and sustainable development. The B.S. in ALIS takes an intercultural and interdisciplinary approach that trains students in their language concentration, as well as in linguistics, literature, media, cultural studies, comparative analysis, and critical awareness.

The B.S. in ALIS program is designed around the cultural perspectives, industry knowledge, humanities skills, and technological innovation required to participate and thrive in the current competitive global market. By coupling advanced language skills with intercultural competence, ALIS majors are positioned to work in a variety of fields that include: local and national government; non-profits and NGOs; healthcare and medicine; international business, law, and trade; global affairs and public policy; new media development and web design; journalism, marketing, and advertising.

Students in this program take 30 credit hours of advanced language study at the 3000-/4000-level, although students may count CHIN 2002/FREN 2002/GRMN 2002/KOR 2002/JAPN 2002/RUSS 2002/SPAN 2002 for CHIN 2501, FREN 2005, KOR 2692, RUSS 2692) for 3 of the 30 credits. In addition, students must complete an 18-credit-hour concentration in an approved cluster, which consists of coursework applied toward certificates, minors, additional degrees, or study-abroad programs. A total of 12 credit hours from the language electives for the ALIS Major Requirements or from the Approved Cluster must be completed abroad in the language of study.

The B.S. in ALIS degree program is intentionally flexible with a high number of free electives, which allows students to combine it with another major or minor(s).

- Bachelor of Science in Applied Languages and Intercultural Studies - Chinese
- Bachelor of Science in Applied Languages and Intercultural Studies - French
- Bachelor of Science in Applied Languages and Intercultural Studies - German
- Bachelor of Science in Applied Languages and Intercultural Studies - Japanese
- Bachelor of Science in Applied Languages and Intercultural Studies - Korean
- Bachelor of Science in Applied Languages and Intercultural Studies - Russian
- Bachelor of Science in Applied Languages and Intercultural Studies - Spanish

International Plan

The degree requirements for the Applied Languages and Intercultural Studies (Chinese, French, German, Japanese, Korean, Russian, and Spanish) - International Plan (ALIS - IP) are basically the same as for the ALIS degree, except that students are required to spend two terms abroad and then achieve Intermediate High (for Chinese, Japanese, and Russian: Intermediate Low) on the standardized ACTFL testing scale during an oral interview. The costs of the test will be paid for by the School of Modern Languages for each student. The terms abroad must total a minimum of twenty-six weeks; typically these consist of one semester of study plus a significant amount of time spent with a research or work project abroad. Only one summer semester abroad will count in this total. ALIS-IP majors are strongly encouraged to enroll in the Language for Business and Technology (LBAT) intensive summer programs offered by the School of Modern Languages.

In addition to gaining advanced global competence, the International Plan designation will set ALIS majors apart from other applicants with recruiters from top companies and governmental agencies. Other required courses include the following, which can easily be obtained within the regular required curriculum offerings of Modern Languages (these requirements can also be met with courses taken abroad, upon consultation with ALIS degree advisors):

1. One course focused on international relations historically and theoretically, including topics such as:
   a. the role of state sovereignty and nationalism and non-state actors in the international system;
   b. international conflict, peace, security, intervention, and nation-building;
   c. international organizations, law, and ethics; and
   d. transnational problems of the environment, terrorism, health, and migration; among other issues.
2. One course that provides a historical and theoretical understanding of the global economy, including topics such as international trade, finance, investment, and production; regional economic integration (such as the EU); economic development and modernization; and questions of natural resource sustainability.
3. One course that provides familiarity with an area of the world or a country that allows them to make systematic comparisons with their own society and culture. A culminating course, occurring either at the end of or after the international experience that integrates knowledge of the discipline and the international experience in a global context. (satisfied by the CHIN 4500/FREN 4500/GRMN 4500/JAPN 4500/KOR 4500/RUSS 4500/SPA

Degree Information

BS/MS Applied Languages and Intercultural Studies

Eligibility requirements:

1. Recommendation of two Modern Languages faculty members

2. Grade of 3.0 or higher in all BS-ALIS coursework as demonstrated through official GT transcript (as of 2019-20 Spanish coursework)

3. Oral proficiency level of at least Intermediate High according to American Council of the Teaching of Foreign Languages (ACTFL) standards and OPI assessment procedures. This will be determined by in-person interview or ACTFL phone test.

4. Students must apply by March 15 of their junior year, so as to be accepted into the program and enroll in the graduate version of the required Intercultural Seminar (Capstone) course in the spring of their senior year.

5. Student acceptance will be recommended by a Graduate Committee comprised of members of the language programs to which students apply.

6. Students must maintain at least a 3.0 GPA throughout the MS ALIS program.

Program of Study and BS/MS ALIS Curriculum:

Following the model of other BS/MS degrees at Georgia Tech, ALIS majors meeting and maintaining eligibility requirements for continuing with the BS/MS ALIS may double count up to 6 credit hours of language study at the 4000 level or higher toward both degrees. BS/MSALIS students must complete at least 146 hours (total hours for BSALIS = 122 credit hours and total hours for MSALIS = 30 credit hours equal 152 credit hours with 6 credit hours being shared = 146 credit hours. Students may double count a 6000-level elective (3 hours) and 6000-level Intercultural Seminar (3 hours) toward undergraduate and graduate requirements.

BS/MS ALIS students also 21 take credit hours of graduate electives (3 credits of this requirement will be completed at undergraduate level), of which 18 or more must be in the target language, while one advisor-approved course not in the target language is allowed (3 credit hours of graduate level coursework taken at the undergraduate level will satisfy both BSALIS ML elective and a MSALIS elective requirement). BS/MS students must also complete Intercultural Seminar (6500) that will satisfy both the undergraduate and graduate seminar requirement.

Bachelor of Science in Applied Languages and Intercultural Studies - Chinese

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1371	Computing for Engineers	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics [8]	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
Approved Cluster [1]		18
ALIS Major Requirements		
CHIN 4500	Advanced Intercultural Seminar [2]	3
Chinese Electives [3]		27
Study Abroad Experience (12 credits from 30 credits of Chinese Electives for the ALIS Major Requirements and/or 18 credits of Approved Cluster) [4]		
Free Electives		
Free Electives [5]		29
Total Credit Hours		**122**

Note: The 12-credit study abroad requirement for the B.S. ALIS degree is temporarily suspended for academic year 2022-2023. ALIS majors will still complete 30-credits of language coursework at the 2002 and above level, including the 4500 Intercultural Seminar, as well as the 18-credit cluster, but will not have to complete 12 of those credits abroad. ALIS majors are encouraged to participate in virtual faculty-led study abroad programs or LBATs or in "Global at Home" immersive programs in the event that study abroad is not possible in their language of study.

1. Designed for coursework toward certificates, minors, additional degrees, or study-abroad programs. Please consult with advisor on course selection.
2. CHIN 4500 "Intercultural Seminar" is the only required language course. CHIN 4500 functions as the capstone course for the B.S. ALIS degree. Students should plan to take this course in their last spring semester before graduation and upon completion of the required international experience. Please consult with advisor on scheduling for the required CHIN 4500 course.
   Note that a student with a valid scheduling conflict may substitute CHIN 4699 (Undergraduate Research) for CHIN 4500 (Intercultural Seminar) with approval from the Director of Undergraduate Studies and/or Assistant Director of Undergraduate Studies. Valid scheduling conflicts include co-oping, interning, or studying abroad in the spring semester of one's senior year or needing to take another required major course in the same time slot in one's senior year.
3. May count CHIN 2002 (or CHIN 2501). All other courses must be 3000- or 4000- level courses. A student who counts CHIN 2002 (or

CHIN 2501) toward the major requirements, may only count one 34XX course toward the major requirements. A student who does not count CHIN 2002 (or CHIN 2501) toward the major requirements, may count up to two 34XX courses toward the major requirements. Additional 34XX courses may be taken as free electives or to fulfil Humanities requirements.

4 A minimum of 12 credits from the Chinese Electives for the ALIS Major Requirements and/or from the Approved Cluster must be completed abroad in Chinese. A student may petition to have the 12-credit study abroad requirement reduced or waived under circumstances of extreme hardship or in the event of program cancellation. If approved, the student would substitute the overseas experience with a comparable cross-cultural experience as approved by the Program Director, Director of Undergraduate Studies, and/or Assistant Director of Undergraduate Studies.

5 Students are strongly encouraged to take additional language courses, linguistics courses, and relevant area studies courses to fulfill free elective credits so as to broaden and/or deepen language and culture learning.

Bachelor of Science in Applied Languages and Intercultural Studies - French

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
or CS 1371	Computing for Engineers	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
Approved Cluster [1]		18
ALIS Major Requirements		
FREN 4500	Advanced Intercultural Seminar [2]	3
French Electives [3]		27
Study Abroad Experience (12 credits from 30 credits of French Electives for the ALIS Major Requirements and/or 18 credits of Approved Cluster) [4]		
Free Electives		
Free Electives [5]		29
Total Credit Hours		**122**

Note: The 12-credit study abroad requirement for the B.S. ALIS degree is temporarily suspended for academic year 2022-2023. ALIS majors will still complete 30-credits of language coursework at the 2002 and above level, including the 4500 Intercultural Seminar, as well as the 18-credit cluster, but will not have to complete 12 of those credits abroad. ALIS majors are encouraged to participate in virtual faculty-led study abroad programs or LBATs or in "Global at Home" immersive programs in the event that study abroad is not possible in their language of study.

1 Designed for coursework toward certificates, minors, additional degrees, or study-abroad programs. Please consult with advisor on course selection.

2 FREN 4500, "Intercultural Seminar" is the only required language course. FREN 4500 functions as the capstone course for the B.S. ALIS degree. Students should plan to take this course in their last spring semester before graduation and upon completion of the required study abroad credits. Please consult with advisor on scheduling for the required FREN 4500 course. Note that a student with a valid scheduling conflict may substitute FREN 4699 (Undergraduate Research) for FREN 4500 (Intercultural Seminar) with approval from the Director of Undergraduate Studies and/or Assistant Director of Undergraduate Studies. Valid scheduling conflicts include co-oping, interning, or studying abroad in the spring semester of one's senior year or needing to take another required major course in the same time slot in one's senior year.

3 French electives are limited to either FREN 2002 or FREN 2005 and 3000- and 4000-level French courses. A student who counts FREN 2002 or FREN 2005 toward the major requirements, may only count one FREN 34XX course toward the major requirements. A student who does not count FREN 2002 or FREN 2005 toward the major requirements, may count up to two FREN 34XX courses toward the major requirements. Additional FREN 34XX courses may be taken as free electives or to fulfill Humanities requirements.

4 A minimum of 12 credits from the French Electives for the ALIS Major Requirements and/or from the Approved Cluster must be completed abroad in French. A student may petition to have the 12-credit study abroad requirement reduced or waived under circumstances of extreme hardship or in the event of program cancellation. If approved, the student would substitute the overseas experience with a comparable cross-cultural experience as approved by the Program Director, Director of Undergraduate Studies, and/or Assistant Director of Undergraduate Studies.

5 Students are strongly encouraged to take additional language courses, linguistics courses, and relevant area studies courses as part of their free elective credits.

Bachelor of Science in Applied Languages and Intercultural Studies - German

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
or CS 1371	Computing for Engineers	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
Approved Cluster [1]		18
ALIS Major Requirements		
GRMN 4500	Advanced Intercultural Seminar [2]	3
German Electives [3]		27
Study Abroad Experience (12 credits from 30 credits of German Electives for the ALIS Major Requirements and/or 18 credits of Approved Cluster) [4]		
Free Electives		
Free Electives		29
Total Credit Hours		**122**

Note: The 12-credit study abroad requirement for the B.S. ALIS degree is temporarily suspended for academic year 2022-2023. ALIS majors will still complete 30-credits of language coursework at the 2002 and above level, including the 4500 Intercultural Seminar, as well as the 18-credit cluster, but will not have to complete 12 of those credits abroad. ALIS majors are encouraged to participate in virtual faculty-led study abroad programs or LBATs or in "Global at Home" immersive programs in the event that study abroad is not possible in their language of study.

1. Designed for coursework toward certificates, minors, additional degrees, or study-abroad programs. Please consult with advisor on course selection.
2. GRMN 4500, "Intercultural Seminar" is the only required language course. GRMN 4500 functions as the capstone course for the B.S. ALIS degree. Students should plan to take this course in their last spring semester before graduation and upon completion of the required study abroad credits. Please consult with advisor on scheduling for the required GRMN 4500 course. Note that a student with a valid scheduling conflict may substitute GRMN 4699 (Undergraduate Research) for GRMN 4500 (Intercultural Seminar) with approval from the Director of Undergraduate Studies and/or Assistant Director of Undergraduate Studies. Valid scheduling conflicts include co-oping, interning, or studying abroad in the spring semester of one's senior year or needing to take another required major course in the same time slot in one's senior year.
3. German electives are limited to GRMN 2002 and 3000- and 4000-level German courses. A student who counts GRMN 2002 toward the major requirements, may only count one GRMN 34XX course toward the major requirements. A student who does not count GRMN 2002 toward the major requirements, may count up to two GRMN 34XX courses toward the major requirements. Additional GRMN 34XX courses may be taken as free electives or to fulfill Humanities requirements.
4. A minimum of 12 credits from the German Electives for the ALIS Major Requirements and/or from the Approved Cluster must be completed abroad in German. A student may petition to have the 12-credit study abroad requirement reduced or waived under circumstances of extreme hardship or in the event of program cancellation. If approved, the student would substitute the overseas experience with a comparable cross-cultural experience as approved by the Program Director, Director of Undergraduate Studies, and/or Assistant Director of Undergraduate Studies.
5. Students are strongly encouraged to take additional language courses, linguistics courses, and relevant area studies courses as part of their free elective credits.

Bachelor of Science in Applied Languages and Intercultural Studies - Japanese

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1301	Introduction to Computing	3

or CS 1315	Introduction to Media Computation	
or CS 1371	Computing for Engineers	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
Approved Cluster [1]		18
ALIS Major Requirements		
JAPN 4500	Advanced Intercultural Seminar [2]	3
Japanese Electives [3]		27
Study Abroad Experience (12 credits from 30 credits of Japanese Electives for the ALIS Major Requirements and/or 18 credits of Approved Cluster) [4]		
Free Electives		
Free Electives [5]		29
Total Credit Hours		**122**

Note: The 12-credit study abroad requirement for the B.S. ALIS degree is temporarily suspended for academic year 2022-2023. ALIS majors will still complete 30-credits of language coursework at the 2002 and above level, including the 4500 Intercultural Seminar, as well as the 18-credit cluster, but will not have to complete 12 of those credits abroad. ALIS majors are encouraged to participate in virtual faculty-led study abroad programs or LBATs or in "Global at Home" immersive programs in the event that study abroad is not possible in their language of study.

1. Designed for coursework toward certificates, minors, additional degrees, or study-abroad programs. Please consult with advisor on course selection.
2. JAPN 4500, "Intercultural Seminar" is the only required language course. JAPN 4500 functions as the capstone course for the B.S. ALIS degree. Students should plan to take this course in their last spring semester before graduation and upon completion of the required study abroad credits. Please consult with advisor on scheduling for the required JAPN 4500 course. Note that a student with a valid scheduling conflict may substitute JAPN 4699 (Undergraduate Research) for JAPN 4500 (Intercultural Seminar) with approval from the Director of Undergraduate Studies and/or Assistant Director of Undergraduate Studies. Valid scheduling conflicts include co-oping, interning, or studying abroad in the spring semester of one's senior year or needing to take another required major course in the same time slot in one's senior year.
3. Japanese electives are limited to JAPN 2002 and 3000- and 4000-level Japanese courses. A student who counts JAPN 2002 toward the major requirements, may only count one JAPN 34XX course toward the major requirements. A student who does not count JAPN 2002 toward the major requirements, may count up to two JAPN 34XX courses toward the major requirements. Additional JAPN 34XX courses may be taken as free electives or to fulfill Humanities requirements.
4. A minimum of 12 credits from the Japanese Electives for the ALIS Major Requirements and/or from the Approved Cluster must be completed abroad in Japanese. A student may petition to have the 12-credit study abroad requirement reduced or waived under circumstances of extreme hardship or in the event of program cancellation. If approved, the student would substitute the overseas experience with a comparable cross-cultural experience as approved by the Program Director, Director of Undergraduate Studies, and/or Assistant Director of Undergraduate Studies.
5. Students are strongly encouraged to take additional language courses, linguistics courses, and relevant area studies courses as part of their free elective credits.

Bachelor of Science in Applied Languages and Intercultural Studies - Korean

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
or CS 1371	Computing for Engineers	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics [8]	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	

Any SS		9
Core F - Courses Related to Major		
Approved Cluster [1]		18
ALIS Major Requirements		
KOR 4500	Intercultural Seminar [2]	3
Korean Electives [3]		27
Study Abroad Experience (12 credits from 30 credits of Korean Electives for the ALIS Major Requirements and/or 18 credits of Approved Cluster) [4]		
Free Electives		
Free Electives [5]		29
Total Credit Hours		**122**

Note: The 12-credit study abroad requirement for the B.S. ALIS degree is temporarily suspended for academic year 2022-2023. ALIS majors will still complete 30-credits of language coursework at the 2002 and above level, including the 4500 Intercultural Seminar, as well as the 18-credit cluster, but will not have to complete 12 of those credits abroad. ALIS majors are encouraged to participate in virtual faculty-led study abroad programs or LBATs or in "Global at Home" immersive programs in the event that study abroad is not possible in their language of study.

1. Designed for coursework toward certificates, minors, additional degrees, or study-abroad programs. Please consult with advisor on course selection.
2. KOR 4500, "Intercultural Seminar" is the only required language course. KOR 4500 functions as the capstone course for the B.S. ALIS degree. Students should plan to take this course in their last spring semester before graduation and upon completion of the required study abroad credits. Please consult with advisor on scheduling for the required KOR 4500 course. Note that a student with a valid scheduling conflict may substitute KOR 4699 (Undergraduate Research) for KOR 4500 (Intercultural Seminar) with approval from the Director of Undergraduate Studies and/or Assistant Director of Undergraduate Studies. Valid scheduling conflicts include co-oping, interning, or studying abroad in the spring semester of one's senior year or needing to take another required major course in the same time slot in one's senior year.
3. Korean electives are limited to KOR 2002 or KOR 2692 and 3000- and 4000-level Korean courses. A student who counts KOR 2002 toward the major requirements, may only count one KOR 34XX course toward the major requirements. A student who does not count KOR 2002 toward the major requirements, may count up to two KOR 34XX courses toward the major requirements. Additional KOR 34XX courses may be taken as free electives or to fulfill Humanities requirements.
4. A minimum of 12 credits from the Korean Electives for the ALIS Major Requirements and/or from the Approved Cluster must be completed abroad in Korean. A student may petition to have the 12-credit study abroad requirement reduced or waived under circumstances of extreme hardship or in the event of program cancellation. If approved, the student would substitute the overseas experience with a comparable cross-cultural experience as approved by the Program Director, Director of Undergraduate Studies, and/or Assistant Director of Undergraduate Studies.
5. Students are strongly encouraged to take additional language courses, linguistics courses, and relevant area studies courses as part of their free elective credits.

Bachelor of Science in Applied Languages and Intercultural Studies - Russian

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
or CS 1371	Computing for Engineers	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics [8]	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
Approved Cluster [1]		18
ALIS Major Requirements		
RUSS 4500	Russian Intercultural Capstone Seminar [2]	3
Russian Electives		27
Study Abroad Experience (12 credits from 30 credits of Russian Electives for the ALIS Major Requirements and/or 18 credits of Approved Cluster) [4]		
Free Electives		
Free Electives [5]		29
Total Credit Hours		**122**

Note: The 12-credit study abroad requirement for the B.S. ALIS degree is temporarily suspended for academic year 2022-2023. ALIS majors will still complete 30-credits of language coursework at the 2002 and above level, including the 4500 Intercultural Seminar, as well as the 18-credit cluster, but will not have to complete 12 of those credits abroad. ALIS

majors are encouraged to participate in virtual faculty-led study abroad programs or LBATs or in "Global at Home" immersive programs in the event that study abroad is not possible in their language of study.

1 Designed for coursework toward certificates, minors, additional degrees, or study-abroad programs. Please consult with advisor on course selection.

2 RUSS 4500, "Intercultural Seminar" is the only required language course. RUSS 4500 functions as the capstone course for the B.S. ALIS degree. Students should plan to take this course in their last spring semester before graduation and upon completion of the required study abroad credits. Please consult with advisor on scheduling for the required RUSS 4500 course. Note that a student with a valid scheduling conflict may substitute RUSS 4699 (Undergraduate Research) for RUSS 4500 (Intercultural Seminar) with approval from the Director of Undergraduate Studies and/or Assistant Director of Undergraduate Studies. Valid scheduling conflicts include co-oping, interning, or studying abroad in the spring semester of one's senior year or needing to take another required major course in the same time slot in one's senior year.

3 Russian electives are limited to RUSS 2002 or RUSS 2692 and 3000- and 4000-level Russian courses. A student who counts RUSS 2002 or RUSS 2692 toward the major requirements, may only count one RUSS 34XX course toward the major requirements. A student who does not count RUSS 2002 or RUSS 2692 toward the major requirements, may count up to two RUSS 34XX courses toward the major requirements. Additional RUSS 34XX courses may be taken as free electives or to fulfil Humanities requirements.

4 A minimum of 12 credits from the Russian Electives for the ALIS Major Requirements and/or from the Approved Cluster must be completed abroad in Russian. A student may petition to have the 12-credit study abroad requirement reduced or waived under circumstances of extreme hardship or in the event of program cancellation. If approved, the student would substitute the overseas experience with a comparable cross-cultural experience as approved by the Program Director, Director of Undergraduate Studies, and/or Assistant Director of Undergraduate Studies.

5 Students are strongly encouraged to take additional language courses, linguistics courses, and relevant area studies courses as part of their free elective credits.

Bachelor of Science in Applied Languages and Intercultural Studies - Spanish

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
or CS 1371	Computing for Engineers	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
Approved Cluster [1]		18
ALIS Major Requirements		
SPAN 4500	Advanced Intercultural Seminar [2]	3
Spanish Electives [3]		27
Study Abroad Experience (12 credits from 30 credits of Spanish Electives for the ALIS Major Requirements and/or 18 credits of Approved Cluster) [4]		
Free Electives		
Free Electives [5]		29
Total Credit Hours		**122**

Note: The 12-credit study abroad requirement for the B.S. ALIS degree is temporarily suspended for academic year 2022-2023. ALIS majors will still complete 30-credits of language coursework at the 2002 and above level, including the 4500 Intercultural Seminar, as well as the 18-credit cluster, but will not have to complete 12 of those credits abroad. ALIS majors are encouraged to participate in virtual faculty-led study abroad programs or LBATs or in "Global at Home" immersive programs in the event that study abroad is not possible in their language of study.

1 Designed for coursework toward certificates, minors, additional degrees, or study-abroad programs. Please consult with advisor on course selection.

2 SPAN 4500, "Intercultural Seminar" is the only required language course. SPAN 4500 functions as the capstone course for the B.S. ALIS degree. Students should plan to take this course in their last spring semester before graduation and upon completion of the required study abroad credits. Please consult with advisor on scheduling for the required SPAN 4500 course. Note that a student with a valid scheduling conflict may substitute SPAN 4699 (Undergraduate Research) for SPAN 4500 (Intercultural Seminar) with approval from the Director of Undergraduate Studies and/or Assistant Director of Undergraduate Studies. Valid scheduling conflicts include co-oping, interning, or studying abroad in the spring semester of one's senior year or needing to take another required major course in the same time slot in one's senior year.

[3] Spanish electives are limited to SPAN 2002 and 3000- and 4000-level Spanish courses. A student who counts SPAN 2002 toward the major requirements, may only count one SPAN 34XX course toward the major requirements. A student who does not count SPAN 2002 toward the major requirements, may count up to two SPAN 34XX courses toward the major requirements. Additional SPAN 34XX courses may be taken as free electives or to fulfil Humanities requirements.

[4] A minimum of 12 credits from the Spanish Electives for the ALIS Major Requirements and/or from the Approved Cluster must be completed abroad in Spanish. A student may petition to have the 12-credit study abroad requirement reduced or waived under circumstances of extreme hardship or in the event of program cancellation. If approved, the student would substitute the overseas experience with a comparable cross-cultural experience as approved by the Program Director, Director of Undergraduate Studies, and/or Assistant Director of Undergraduate Studies.

[5] Students are strongly encouraged to take additional language courses, linguistics courses, and relevant area studies courses as part of their free elective credits.

BACHELOR OF SCIENCE IN APPLIED PHYSICS

The School of Physics offers two undergraduate degrees, the Bachelor of Science in Physics and the Bachelor of Science in Applied Physics.

The degree program in applied physics may be better suited for entry into industry or government upon graduation, preparation for further professional training (medicine, law, dentistry, or business), or preparation for graduate study in some other discipline. The applied physics program differs from the traditional one in that a few courses intended primarily as preparation for graduate study in physics are replaced by courses oriented toward the applications of physics.

Each of the baccalaureate programs contains the following: a) courses needed to meet general institutional degree requirements; b) a core of technical courses intended to give a strong background in mathematics and the physical principles of mechanics, electricity and magnetism, thermodynamics, and the quantum theory that governs physical phenomena at the microscopic level of molecules, atoms, and nuclei; c) technical electives that enable the student to explore areas of their choice in greater depth; d) courses involving undergraduate research, and e) free electives, about fifteen percent of the total hours, which may be employed to schedule additional technical or nontechnical courses.

The considerable flexibility inherent in the physics curricula is advantageous to students who wish to work out individual programs of study. At the same time, this flexibility suggests the need for consultation with advisors so students can make the best use of elective hours and avoid scheduling difficulties that may arise in later semesters. Students may utilize their elective freedom in the physics curricula to specialize in particular areas of physics, to prepare for careers in interdisciplinary areas of science, to compose a preprofessional program, or to gain a background in other technical or nontechnical disciplines. Students should contact their academic advisor for assistance in planning programs of study with emphasis directed toward a particular objective.

Since some students who earn a degree in physics have transferred from other disciplines, the School has planned its degree programs to enable most students to transfer into physics with little or no loss of credit.

A total of 120 credit hours (exclusive of wellness) and a grade-point average of at least 2.0 in physics courses numbered 3000 and higher are requisites for the bachelor's degree in physics.

Physics: Undergraduate Information

Undergraduate Admissions

- Bachelor of Science in Applied Physics - General
- Bachelor of Science in Applied Physics - Business Option
- Bachelor of Science in Applied Physics - Physics of Living Systems

BS/MS OPTION

The BSMS Option allows eligible students to double count a maximum of 6 credit hours toward undergraduate and graduate requirements while still completing all other program requirements to earn both degrees.

To apply for the option, undergraduate Physics students (BS in Applied Physics or BS in Physics) must have at least 30 credit hours earned at Georgia Tech with an undergraduate GPA of 3.3 or higher, and fewer than 90 credits overall (including transfer credit).

The minimum GPA to graduate with an undergraduate degree in Applied Physics/Physics to continue to the MS in Physics program is 3.0. The minimum GPA for graduation with the MS in 2.7.

Students will need to consult with an advisor to indicate which courses are sharing with the graduate degree in DegreeWorks.

Bachelor of Science in Applied Physics - General

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1371	Computing for Engineers	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [1]	4
PHYS 2212	Introductory Physics II [6]	4
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
or MATH 1554	Linear Algebra	
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Choose one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus	4
MATH 2552	Differential Equations	4
CHEM 1310	General Chemistry	4
or CHEM 1211K	Chemical Principles I	
PHYS 2213	Introduction to Modern Physics	3
PHYS 3201	Classical Mechanics I	3
Upper-Level Physics		
PHYS 3122	Electrostatics and Magnetostatics	3
PHYS 3123	Electrodynamics	3

PHYS 3141	Thermodynamics	3
PHYS 3143	Quantum Mechanics I	3
PHYS 3211	Electronics I	5
PHYS 3266	Computational Physics	4
PHYS 4206	Electronics II	5
PHYS 4321	Advanced Laboratory I	3
PHYS 4601	Senior Seminar I	1
PHYS 4602	Senior Seminar II	1
Physics or Technical Electives		
Any PHYS or Technical Electives [2,3,4,5]		14
Free Electives		
Free Electives		14
Total Credit Hours		**122**

Student must have 2.0 in all PHYS classes 3000-level or higher

Pass-fail only allowed for Free Electives, Humanities, and Social Sciences.

1 If PHYS 2231 is taken, extra hour goes toward Free Electives

2 CHEM 3411, CHEM 3412, CHEM 3511, EAS 2750, EAS 4300, EAS 4430, MATH 2106, MATH 3215, MATH 3235, MATH 4320, MATH 4347, MATH 4348, MATH 4581, NRE 3301, NRE 4610

3 Minimum of one class in PHYS 3211, PHYS 3226, PHYS 4322

4 Maximum of six credit hours below 3000-level

5 Maximum of nine credit hours PHYS 2699 or PHYS 4699

6 If PHYS 2232 is taken, extra hour goes toward Free Electives

Bachelor of Science in Applied Physics - Business Option

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1371	Computing for Engineers	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [1]	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
or MATH 155	Linear Algebra	
or MATH 155	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Choose one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
ECON 2106	Principles of Microeconomics	3
Any SS		6
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus	4
MATH 2552	Differential Equations	4
CHEM 1310	General Chemistry	4
or CHEM 12	Chemical Principles I	
PHYS 2213	Introduction to Modern Physics	3
PHYS 3201	Classical Mechanics I	3
Upper-Level Physics		
PHYS 3122	Electrostatics and Magnetostatics	3
PHYS 3123	Electrodynamics	3
PHYS 3141	Thermodynamics	3
PHYS 3143	Quantum Mechanics I	3
PHYS 3211	Electronics I	5
PHYS 3266	Computational Physics	4
PHYS 4206	Electronics II	5
PHYS 4321	Advanced Laboratory I	3
PHYS 4601	Senior Seminar I	1
PHYS 4602	Senior Seminar II	1
Physics or Technical Electives		
Any PHYS or Technical Electives [2, 3, 4, 5]		14
Business Option		
ACCT 2101	Accounting I: Financial Accounting	3
or MGT 3006	Financial and Managerial Accounting	
MGT 3101	Organizational Behavior	3
or MGT 315	Principles of Management	
or PSYC 22	Industrial/Organizational Psychology	
Choose one of the following:		6
MGT 3062	Financial Management	
MGT 3078	Finance and Investments	
MGT 3300	Marketing Management I	
MGT 3660	International Business	
MGT 4015	Advanced Managerial Accounting	
MGT 4026	Financial Reporting and Analysis I	
MGT 4028	Financial Analysis and Reporting of Technology Firms	
MGT 4030	International Accounting	
MGT 4190	Strategic Quality Management and Competitiveness	
MGT 4191	The Entrepreneurship Forum	
MGT 4192	Impact Speaker Series Forum	
MGT 4193	Servant Leadership, Values & Systems	
MGT 4194	Social Enterprise and Entrepreneurship	
MGT 4303	Personal Selling and Sales Management	
MGT 4304	Strategic Brand Management	

	MGT 4307	Strategic Marketing
	MGT 4335	International Marketing
	MGT 4610	Law, Management, and Economics
	MGT 4670	Entrepreneurship
Free Electives		
Free Electives		2
Total Credit Hours		**122**

Student must have 2.0 in all PHYS classes 3000-level or higher

Pass-fail only allowed for Free Electives, Humanities, and Social Sciences.

1 If PHYS 2231 is taken, extra hour goes toward Free Electives

2 CHEM 3411, CHEM 3412, CHEM 3511, EAS 2750, EAS 4300, EAS 4430, MATH 2106 MATH 3215, MATH 3235, MATH 4320, MATH 4347, MATH 4348, MATH 4581, NRE 3301, NRE 4610

3 Minimum of one class in PHYS 3211, PHYS 3226, PHYS 4322

4 Maximum of six credit hours below 3000-level

5 Maximum of nine credit hours PHYS 2699 or PHYS 4699

BACHELOR OF SCIENCE IN ARCHITECTURE

The Bachelor of Science in Architecture (B.S. Arch) offers a rigorous and distinguished architectural education profile for our students around technology in all areas – design, history, theory, and communication. It is defined by a knowledge of how to think about and apply technology in architecture. Our program offers flexibility in the design studio sequence to allow coordinated interdisciplinary work with other schools at Georgia Tech. We build our academic foundation on studio classes, history and theory, and a deliberate blend of technology and design. We offer incubator workshops to all our students, from Freshmen through Seniors, which allow them to follow their intellectual passions and hone in-demand skills. Our students graduate with a broad-based undergraduate education grounded in design, science, and technology.

The Bachelor of Science in Architecture program prepares students for graduate-level studies in architecture, for graduate study in related fields, or a variety of careers related to architecture, the building industry, or government service.

Grade Requirements

Students must pass all architecture undergraduate studios with a grade of C or above in order to move forward to the next studio in the sequence.

A maximum of 9 credit hours may be taken on a pass/fail basis. Only courses taken as free electives within the undergraduate curriculum are eligible for pass/fail credit. See Institute regulations regarding pass/fail courses.

Students who complete both the Bachelor of Science in Architecture (BS Arch) and Master of Architecture (M.Arch.) in the Georgia Tech School of Architecture may apply up to 6 credit hours of graduate coursework toward both degrees. In order to qualify for this option, the student must complete the undergraduate degree with a cumulative grade-point average of 3.5 or higher and enter the Masters program in the following fall term.

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [1]	4
Lab Science		4
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
ARCH 1016	Foundation Studio 1 [2]	4
ARCH 1017	Architecture Design Studio 1 [2]	5
ARCH 1020	Media + Modeling 1	3
ARCH 1060	Introduction to Design and the Built Environment	3
ARCH 2111	History of Architecture I	3
Major Requirements		
ARCH 2016	Architecture Design Studio 2 [2]	5
ARCH 2017	Architecture Design Studio 3 [2]	5
ARCH 2020	Media + Modeling 2	3
ARCH 2112	History of Architecture II	3
ARCH 2211	Construction Technology and Design Integration I	3
ARCH 3016	Architecture Design Studio 4 [2]	5
ARCH 3017	Architecture Design Studio 5 [2]	5
ARCH 3231	Environmental Systems and Design Integration I	3
ARCH 4015	Structures 1	3
ARCH 4016	Architecture Design Studio 6 [2,3]	5
ARCH 4017	Architecture Design Studio 7 [2,3]	6
ARCH 4803	Special Topics (Design Strategies)	3
Free Electives		
Free Electives		12
Total Credit Hours		**124**

Pass-fail only allowed for Free Electives.

1. If PHYS 2231 is taken, excess hour applies to Free Electives.
2. C minimum or higher
3. A cluster option of 11 hours of Architecture courses with a grade of 'C' or higher may be used in place of ARCH 4016 and ARCH 4017. See advisor for approval

International Plan

The International Plan (IP) in the School of Architecture is a challenging and coherent academic program for undergraduate students who will develop an introductory level of global competence within the study of architecture. The International Plan is an intensive degree-long program designed to prepare students with the ability to:

1. assimilate comfortably in a constantly evolving international context within the profession of architecture,
2. value how architecture is practiced in different global contexts,

3. function effectively in a multi-national academic and work environment, and
4. understand the complexity of the global economy and the importance of developing a sensibility to international relations.

While many students gain some exposure to these aspects of today's world through the patchwork of traditional international opportunities such as study abroad and international internships, IP is designed to develop a deeper level of competency in these areas within the study of architecture.

The requirements of IP are:

1. Proficiency in a Foreign Language
2. Globally Focused Courses
3. International Experience, and
4. A Capstone Course

IP students in the School or Architecture can fulfill the International Experience requirement of the International Plan by participation in a university-approved international program with the approval of the School of Architecture.

Undergraduate students in the School of Architecture must hold a minimum 2.5 GPA at the time of application to be eligible for the International Plan . Students must complete each architectural design studio with a grade of C or above in order to move forward in the sequence and maintain eligibility for IP. Students will not be allowed to study abroad until they have completed the first four foundational studios.

For more information on IP, visit www.arch.gatech.edu/international-education.

BACHELOR OF SCIENCE IN ATMOSPHERIC AND OCEANIC SCIENCES

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1371	Computing for Engineers	
Core C - Humanities [1]		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I	4
CHEM 1211K	Chemical Principles I	4
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
Core E - Social Sciences [1]		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
PHYS 2212	Introductory Physics II	4
MATH 2551	Multivariable Calculus	4
MATH 2552	Differential Equations	4
EAS 1600	Introduction to Environmental Science	4
EAS 2750	Physics of the Weather	3
EAS 2551	Introduction to Meteorological Analysis	1
Major Requirements		
EAS 2655	Quantitative Techniques in Earth and Atmospheric Sciences	3
EAS 3603	Thermodynamics of Earth Systems	3
EAS 4655 & EAS 4656	Atmospheric Dynamics and Atmospheric Dynamics Practicum	4
EAS 4740	Atmospheric Chemistry Laboratory	3
or EAS 4670	Atmospheric Dynamics II	
or EAS 4305	Physical and Chemical Oceanography	
EAS 4801	Special Topics (Career Development Seminar)	1
Select 7 credit hours from the following:		7
EAS 4420	Environmental Field Methods	
EAS 4813	Special Topics (Geophysical Field Methods)	
EAS 4610	Earth System Modeling	
Research Option		
AOS Technical Electives		**15**
CHEM 1212K	Chemical Principles II	
EAS 3110	Energy, Environment, and Society	
EAS 4300	Introduction to Physical and Chemical Oceanography	
EAS 4305	Physical and Chemical Oceanography	
EAS 4410	Climate and Global Change	
EAS 4450	Synoptic Meteorology	
EAS 4525	Weather Risk and Catastrophe Modeling	
EAS 4470	Large-scale Atmospheric Circulations	
EAS 4740	Atmospheric Chemistry Laboratory	
EAS 4420	Environmental Field Methods	
EAS 4480	Environmental Data Analysis	
EAS 4610	Earth System Modeling	
EAS 4651	Practical Internship	
EAS 4670	Atmospheric Dynamics II	
EAS 4695	Undergraduate Internship	
EAS 4698	Undergraduate Research Assistantship	
EAS 4699	Undergraduate Research	
EAS 4803	Special Topics (Tropical Dynamics)	
EAS 4803	Special Topics (Glacial and Ice Sheet Dynamics)	
EAS 4814	Special Topics-Lab (Geophysical Field Methods)	
EAS 4814	Special Topics-Lab (Mesoscale Meteorology)	
Free Electives [1,2]		**21**
Total Credit Hours		**122**

1. Pass/Fail allowed only for Humanities, Social Sciences, and Free electives
2. Nine (9) hours must be 3000-4000-level. Students must complete at least 39 hours of 3000-4000 level coursework.

BACHELOR OF SCIENCE IN BIOCHEMISTRY

The Bachelor of Science in Biochemistry degree program includes a combination of requirements and electives that ensure a strong foundation in the chemical and biological sciences, while providing the flexibility to tailor the curriculum to satisfy specific interests or career goals. This program may be of interest to students who aspire to careers in research, teaching, or in a life/health science profession (medicine, pharmacy, dentistry). The judicious use of free electives also enables the student to achieve considerable knowledge of other disciplines at Georgia Tech, such as chemical and biomolecular engineering, bioinformatics (computing), biomedical engineering, and biology. The biochemistry curriculum enables majors who are interested in medical, dental, or law school to meet admission requirements of these schools.

Chemistry Website

- Bachelor of Science in Biochemistry - General
- Bachelor of Science in Biochemistry - Business Option
- Bachelor of Science in Biochemistry - Pre-health Option

International Plan

The BS in Chemistry (International Plan) and BS in Biochemistry (International Plan) are offered to undergraduate students seeking to understand their majors in a global perspective. Students in this program must demonstrate proficiency in a foreign language; complete coursework in a country/regional elective, international relations, and global economics; and participate in a study or research abroad experience (usually in the junior year). If a student is pursuing a research abroad experience, they are required to complete a supervised research experience with a faculty member in chemistry or biochemistry at the host institution. Upon successful completion of degree requirements for the International Plan, a "International Plan" designator is indicated on the diploma. If interested in participating in the International Plan as part of the BS in Chemistry or BS in Biochemistry, students should visit: www.internationalplan.gatech.edu.

Chemistry Website

Research Option

The BS in Chemistry (Research Option) and BS in Biochemistry (Research Option) are offered for students who wish to participate in a research project under the supervision of one of the fifty members of faculty and adjunct faculty in the School. Participants in the Research Option learn how to address a research problem from experiment design and execution to interpretation of results. There is an expectation that undergraduates who contribute to completed studies will be co-authors on submissions to high-quality scholarly journals. Research projects are available in the traditional areas of chemistry (analytical, biological, inorganic, organic, and physical chemistry) as well as highly interdisciplinary research areas, such as nanochemistry, polymer and materials chemistry, environmental chemistry and sensors, medicinal chemistry, molecular biophysics, and computational chemistry.

To pursue the Research Option in the School of Chemistry and Biochemistry, students should obtain a research project with a faculty member in the department and apply online via www.undergradresearch.gatech.edu. Successful completion of the Research Option requires the following:

Code	Title	Credit Hours
Select one of the following research options: [1]		9
CHEM 4698/4699	Undergraduate Research Assistantship	
LMC 4701	Undergraduate Research Proposal Writing (complete during the first or second semester of research) [2]	1
LMC 4702	Undergraduate Research Thesis Writing (take during the term in which students complete their thesis) [3]	1
Total Credit Hours		**11**

[1] supervised research with faculty over three or more semesters
[2] approval of proposal on project by a committee of two or more faculty
[3] submission of an approved thesis

Successful completion of the Research Option is noted on the student's transcript. Students completing this option often pursue graduate studies in the chemical or biological sciences or research careers in industrial or governmental laboratories.

Chemistry Website

BSMS Option

The BSMS Option allows eligible students to double count a maximum of 6 credit hours toward undergraduate and graduate requirements while still completing all other program requirements to earn both degrees. The credit must be approved coursework (4000-level or higher; not seminar or research credit) completed with a grade of 'B' or higher. The allowable courses are: CHEM 4113, CHEM 4311, CHEM 4341, CHEM 4401, CHEM 4452, CHEM 4485, CHEM 4521,
CHEM 4740, CHEM 4759, CHEM 4760, CHEM 4762, CHEM 4765, CHEM 4775, CHEM 4776, CHEM 4785. Special Topics will be considered on a case by case basis.

To apply for the option, undergraduate Biochemistry students must have at least 30 credit hours earned at Georgia Tech with an undergraduate GPA of 3.3 or higher, and fewer than 90 credits overall (including transfer credit).

The minimum GPA to graduate with an undergraduate degree in Biochemistry to continue to the MS in Chemistry program is 3.0. The minimum GPA for graduation with the MS in 2.7.

Students will need to consult with an advisor to indicate which courses are sharing with the graduate degree in DegreeWorks.

Bachelor of Science in Biochemistry - Business Option

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
or CS 1371	Computing for Engineers	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
ECON 2106	Principles of Microeconomics	3
Any SS		6
Core F - Courses Related to Major		
CHEM 1211K	Chemical Principles I	4
CHEM 1212K	Chemical Principles II	4
CHEM 2380	Synthesis Laboratory I	2
MATH 2551	Multivariable Calculus	4
BIOS 1107 & 1107L	Biological Principles and Biological Principles Laboratory	4
Major Requirements		
CHEM 2216 & 2216L	Quantitative Chemical Analysis and Quantitative Chemical Analysis Laboratory	4
or CHEM 22	Quantitative Chemical Analysis	
CHEM 2311	Organic Chemistry I	3
CHEM 2312	Organic Chemistry II	3
or CHEM 23	Organic and Bioorganic Chemistry	
CHEM 3216 & 3216L	Analytical Chemistry Lecture and Analytical Chemistry Laboratory	5
or CHEM 32	Analytical Chemistry	
CHEM 3371	Organic Chemistry Laboratory	2
CHEM 3411	Physical Chemistry I	3
CHEM 4511	Biochemistry I	3
or CHEM 35	Biochemistry I	
CHEM 4512	Biochemistry II	3
or CHEM 352	Biochemistry II	
CHEM 4521	Biophysical Chemistry	3
CHEM 4581	Biochemistry Laboratory I	3
CHEM 4582	Biochemistry Laboratory II	3
CHEM 4601	Chemistry Seminar	2
Biology Electives		
BIOS 2600	Genetics	3
BIOS 3450	Cell and Molecular Biology	3
Select one of the following:		3
BIOS 3380	Microbiology	
BIOS 3450	Cell and Molecular Biology	
BIOS 4015	Cancer Biology and Biotechnology	
BIOS 4340	Medical Microbiology	
BIOS 4400	Human Neuroanatomy	
BIOS 4401	Experimental Design and Statistical Methods in Biological Sciences	
BIOS 4418	Microbial Physiology	
BIOS 4464	Developmental Biology	
BIOS 4570	Immunology	
BIOS 4607	Molecular Biology of Microbes: Disease, Nature, and Biotechnology	
BIOS 4668	Eukaryotic Molecular Genetics	
CHEM 4765	Drug Design, Development, and Delivery	
Business Option		
ACCT 2101	Accounting I: Financial Accounting	3
or MGT 3000	Financial and Managerial Accounting	
MGT 3101	Organizational Behavior	3
or MGT 315	Principles of Management	
or PSYC 22	Industrial/Organizational Psychology	
Select two of the following:		6
MGT 3062	Financial Management	
MGT 3078	Finance and Investments	
MGT 3300	Marketing Management I	
MGT 3660	International Business	
MGT 4015	Advanced Managerial Accounting	
MGT 4026	Financial Reporting and Analysis I	
MGT 4028	Financial Analysis and Reporting of Technology Firms	
MGT 4030	International Accounting	
MGT 4190	Strategic Quality Management and Competitiveness	
MGT 4191	The Entrepreneurship Forum	
MGT 4192	Impact Speaker Series Forum	
MGT 4193	Servant Leadership, Values & Systems	
MGT 4194	Social Enterprise and Entrepreneurship	
MGT 4303	Personal Selling and Sales Management	
MGT 4304	Strategic Brand Management	
MGT 4307	Strategic Marketing	
MGT 4335	International Marketing	
MGT 4610	Law, Management, and Economics	

MGT 4670	Entrepreneurship	
Free Electives		
Free Electives [1]		1
Total Credit Hours		**122**

Pass-fail only allowed for Free Electives.

[1] A maximum of twelve credit hours of CHEM 4699 taken on a letter-grade basis are permitted for the degree program. Up to six hours of CHEM 2699 taken on a letter-grade basis may be used as free electives.

Bachelor of Science in Biochemistry - General

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
or CS 1371	Computing for Engineers	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra [3]	2
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
CHEM 1211K	Chemical Principles I	4
CHEM 1212K	Chemical Principles II	4
CHEM 2380	Synthesis Laboratory I	2
MATH 2551	Multivariable Calculus	4
BIOS 1107 & 1107L	Biological Principles and Biological Principles Laboratory	4
Major Requirements		
CHEM 2216 & 2216L	Quantitative Chemical Analysis and Quantitative Chemical Analysis Laboratory	4
or CHEM 2204	Quantitative Chemical Analysis	
CHEM 2311	Organic Chemistry I	3
CHEM 2312	Organic Chemistry II	3
or CHEM 2303	Organic and Bioorganic Chemistry	
CHEM 3216 & 3216L	Analytical Chemistry Lecture and Analytical Chemistry Laboratory	5
or CHEM 32	Analytical Chemistry	
CHEM 3371	Organic Chemistry Laboratory	2
CHEM 3411	Physical Chemistry I	3
CHEM 4511	Biochemistry I	3
or CHEM 352	Biochemistry I	
CHEM 4512	Biochemistry II	3
or CHEM 35	Biochemistry II	
CHEM 4521	Biophysical Chemistry	3
CHEM 4581	Biochemistry Laboratory I	3
CHEM 4582	Biochemistry Laboratory II	3
CHEM 4601	Chemistry Seminar	2
Biology Electives [2]		
BIOS 2600	Genetics	3
BIOS 3450	Cell and Molecular Biology	3
Select one of the following:		3
BIOS 3380	Microbiology	
BIOS 3450	Cell and Molecular Biology	
BIOS 4015	Cancer Biology and Biotechnology	
BIOS 4340	Medical Microbiology	
BIOS 4401	Experimental Design and Statistical Methods in Biological Sciences	
BIOS 4418	Microbial Physiology	
BIOS 4464	Developmental Biology	
BIOS 4570	Immunology	
BIOS 4607	Molecular Biology of Microbes: Disease, Nature, and Biotechnology	
BIOS 4668	Eukaryotic Molecular Genetics	
CHEM 4765	Drug Design, Development, and Delivery	
Free Electives		
Free Electives [1,2,4]		13
Total Credit Hours		**122**

[1] VIP courses may be used only as free electives.
[2] Courses may be applied toward completion of a minor.
[3] MATH 1554 or MATH 1564 may be used in place of MATH 1553.
[4] A maximum of twelve credit hours of CHEM 4699 taken on a letter-grade basis are permitted for the degree program. Up to six hours of CHEM 2699 taken on a letter-grade basis may be used as free electives

Bachelor of Science in Biochemistry - Pre-Health Option

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
or CS 1371	Computing for Engineers	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra [5]	2
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS [1]		9
Core F - Courses Related to Major		
CHEM 1211K	Chemical Principles I	4
CHEM 1212K	Chemical Principles II	4
CHEM 2380	Synthesis Laboratory I	2
BIOS 1107 & 1107L	Biological Principles and Biological Principles Laboratory	4
BIOS 1108 & 1108L	Organismal Biology and Organismal Biology Laboratory [4]	4
Major Requirements		
CHEM 2216 & 2216L	Quantitative Chemical Analysis and Quantitative Chemical Analysis Laboratory	4
or CHEM 2201	Quantitative Chemical Analysis	
CHEM 2311	Organic Chemistry I	3
CHEM 2312	Organic Chemistry II	3
or CHEM 2303	Organic and Bioorganic Chemistry	
CHEM 3216 & 3216L	Analytical Chemistry Lecture and Analytical Chemistry Laboratory	5
or CHEM 32	Analytical Chemistry	
CHEM 3371	Organic Chemistry Laboratory	2
CHEM 3411	Physical Chemistry I	3
CHEM 4511	Biochemistry I	3
or CHEM 35	Biochemistry I	
CHEM 4512	Biochemistry II	3
or CHEM 35	Biochemistry II	
CHEM 4581	Biochemistry Laboratory I	3
CHEM 4582	Biochemistry Laboratory II	3
CHEM 4601	Chemistry Seminar	2
Pre-Health Electives [4]		
Select 12 credits from the following:		12
BIOS 2600	Genetics	
BIOS 2601	Genetics Laboratory	
BIOS 2610 & BIOS 261	Integrative Genetics and Integrative Genetics Lab	
BIOS 3000	Survey of Medicine	
BIOS 3380	Microbiology	
BIOS 3381	Microbiology Lab	
BIOS 3450	Cell and Molecular Biology	
BIOS 3451	Cell and Molecular Biology Lab	
BIOS 3753	Human Anatomy	
BIOS 3754	Laboratory in Human Anatomy	
BIOS 3755	Human Physiology	
BIOS 3756	Physiology Laboratory	
BIOS 4012	Protein Biology	
BIOS 4015	Cancer Biology and Biotechnology	
BIOS 4150/ BIOL 6150	Genomics and Applied Bioinformatics	
BIOS 4200	Kinesiological Basis of Human Movement	
BIOS 4238/ APPH 6238	Ion Channels	
BIOS 4340	Medical Microbiology	
BIOS 4400	Human Neuroanatomy	
BIOS 4401	Experimental Design and Statistical Methods in Biological Sciences	
BIOS 4440	Human Pathology	
BIOS 4464	Developmental Biology	
BIOS 4471	Behavioral Biology	
BIOS 4500	Drug Discovery	
BIOS 4510/ BIOL 8510	Epigenetics, Stem Cells, and Development	
BIOS 4520	Health Genes Society	
BIOS 4530/ BIOL 8530	Human Evolutionary Genomics	
BIOS 4545	Genetics of Complex Human Traits and Diseases	
BIOS 4560/ BIOL 8560	RNA Biology and Biotechnology	
BIOS 4570	Immunology	
BIOS 4744	Microbial Symbiosis & Microbiomes	

	BIOS 4607/ BIOL 6607	Molecular Biology of Microbes: Disease, Nature, and Biotechnology
	BMED 3100	Systems Physiology
	BMED 3600	Physiology of Cellular and Molecular Systems
	CHEM 4521	Biophysical Chemistry
	CHEM 4765	Drug Design, Development, and Delivery
Free Electives		
Free Electives [1,3,4,6]		13
Total Credit Hours		**122**

Pass-fail only allowed for Free Electives.

1 It is suggested that students select pre-health preparation courses (SOC and PSYC).
2 It is suggested that students select pre-health preparation courses (BIOS, HTS, LMC, PSYC)
3 VIP courses may be used only as free electives.
4 Courses may be applied toward completion of a minor.
5 MATH 1554 or MATH 1564 may be used in place of MATH 1553.
6 A maximum of twelve credit hours of CHEM 4699 taken on a letter-grade basis are permitted for the degree program. Up to six hours of CHEM 2699 taken on a letter-grade basis may be used as free electives.

BACHELOR OF SCIENCE IN BIOLOGY

Faculty in the School of Biological Sciences believe that one learns science best by doing science. Many Biology courses feature authentic, student-driven research projects, and all Biology majors participate in research through undergraduate research courses. The School also offers many interdisciplinary courses, including bio-inspired design, bioethics, biophysics, mathematical models in biology, genomics and applied bioinformatics, signaling molecules, macromolecular modeling, aquatic chemical ecology, and experimental design and statistics. The Biology degree includes 21 hours of customizable technical electives and offers multiple options for students to tailor the degree for individual career goals, including the Research Option, Business Option, Pre-Health focus, Internships, Research, Teaching Assistant (TA) experience, Study Abroad & International Plan, Biology certificates and BS/MS options in Biology and Bioinformatics.

Biology graduates of Georgia Tech are expert, quantitative problem solvers ready to apply their skills in many different career paths. The undergraduate curriculum for the Bachelor of Science in Biology degree is designed to prepare students for employment in academia, government, or industry; for graduate studies in the biological sciences or science teaching; or for admission to medical, dental, or veterinary schools.

Biology Undergraduate Programs

- Bachelor of Science in Biology - General
- Bachelor of Science in Biology - Business Option

International Plan

Georgia Tech's International Plan, through the Office of International Education (www.oie.gatech.edu/), involves two study abroad experiences and coursework in global studies. The plan offers a challenging and coherent academic program for students to develop global competence within the context of a Biology degree. The requirements include: language proficiency equivalent to two years of college coursework (twelve hours), one course in international relations (three hours), global economy (three hours), focused study of a region (three hours), an integrative course synthesizing the international experience (three hours), and two semesters (minimum of 26 weeks) in residence abroad. Georgia Tech biological sciences (BIOS) courses are taught in several Study Abroad programs such as the Pacific program, the BEST-Lyon program, and the Barcelona program. In addition, many biological sciences (BIOS)-equivalent courses are available through Georgia Tech partner universities abroad (www.oie.gatech.edu/sa/programs/). Some of these universities teach biology courses in English, such as Hong Kong University, Tokyo Technological University, University of Victoria (New Zealand), National University of Singapore, University of Strathclyde (Scotland), and Bilkent University (Turkey). Successful completion of this plan earns students an international designation on their Georgia Tech degree.

Research Option

This Research Option enables students to complete nine credit hours of supervised research with a Biology faculty member over multiple semesters. With faculty guidance, students write a brief proposal, perform independent, original research, and write a thesis about their work. The thesis is evaluated by two Biology Faculty members. The first six credit hours of the research option are taken as BIOS 4699 (research for credit) or BIOS 4698 (research for pay). Students then take either BIOS 4690 in their final semester and two, one credit-hour writing courses, LMC 4701 and LMC 4702. These writing courses can be counted as Biology electives for Research Option students. Note that LMC 4701 should be taken in the semester prior to enrolling in BIOS 4690. The student's research is presented in BIOS 4460.

Code	Title	Credit Hours
Select one of the following research options:		6
BIOS 4699	Undergraduate Research	
BIOS 4698	Research Assistantship	
In the final semester of study, select the following courses:		
BIOS 4690	Independent Research Project	3
LMC 4701 & LMC 4702	Undergraduate Research Proposal Writing and Undergraduate Research Thesis Writing [1]	2
Total Credit Hours		**11**

[1] These writing courses can be counted as Biology electives for Research Option students. Note that LMC 4701 should be taken in the semester prior to enrolling in BIOS 4690.

Successful completion of this option earns students a "Research Option in Biology" designation on their Georgia Tech transcripts.

BS/MS Programs

The School of Biological Sciences offers two BS/MS Options:

BS in Biology/MS in Biology

BS in Biology/MS in Bioinformatics

Bachelor of Science in Biology - Business Option

Effective Spring 2020: The School of Biological Sciences has transitioned all undergraduate Biology (BIOL) and Applied Physiology (APPH) courses to Biological Sciences (BIOS) to reflect the merger of the two Schools. Courses under the BIOL- and APPH- may still apply to these requirements. Students should consult with advisors to determine which requirements have been met.

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
or MATH 15	Calculus for Life Sciences	
Core B - Institutional Options		
Select one of the following:		3
CS 1301	Introduction to Computing	

CS 1315	Introduction to Media Computation	
CS 1371	Computing for Engineers	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
ECON 2106	Principles of Microeconomics	3
Any SS		6
Core F - Courses Related to Major		
BIOS 1207 & 1207L	Biological Principles for Majors and Biological Principles Project Laboratory	4
or BIOS 1107 & 1107L	Biological Principles and Biological Principles Laboratory	
CHEM 1211K	Chemical Principles I	4
CHEM 1212K	Chemical Principles II	4
CHEM 2311	Organic Chemistry I	3
CHEM 2312	Organic Chemistry II	3
or CHEM 2303	Organic and Bioorganic Chemistry	
Major Requirements		
BIOS 1208 & 1208L	Organismal Biology for Majors and Organismal Biology Project Laboratory	4
or BIOS 1108 & 1108L	Organismal Biology and Organismal Biology Laboratory	
BIOS 2300	Ecology	3
or BIOS 2310	Problems in Ecology	
BIOS 3450	Cell and Molecular Biology	3
BIOS 2600	Genetics	3
or BIOS 2610	Integrative Genetics	
Biology Lab [1]		2
BIOS 3600	Evolutionary Biology	3
BIOS 4460	Communicating Biological Research	1
Select one of the following:		3
BIOS 4590	Research Project Lab	
BIOS 4690	Independent Research Project	
Non-Biology Courses		
CHEM 2380	Synthesis Laboratory I	2
or CHEM 2380	Synthesis Laboratory I	
Select one from the following:		3
BIOS 3400	Mathematical Models in Biology	
BIOS 4150	Genomics and Applied Bioinformatics	
BIOS 4401	Experimental Design and Statistical Methods in Biological Sciences	
Biology Electives		
Biology Electives at 3000-level or higher [2]		15
Business Option		
ACCT 2101	Accounting I: Financial Accounting	3
or MGT 3001	Financial and Managerial Accounting	
Select one of the following:		3
MGT 3101	Organizational Behavior	
MGT 3150	Principles of Management	
PSYC 2220	Industrial/Organizational Psychology	
Select two of the following:		6
MGT 3062	Financial Management	
MGT 3078	Finance and Investments	
MGT 3300	Marketing Management I	
MGT 3660	International Business	
MGT 4015	Advanced Managerial Accounting	
MGT 4026	Financial Reporting and Analysis I	
MGT 4028	Financial Analysis and Reporting of Technology Firms	
MGT 4030	International Accounting	
MGT 4190	Strategic Quality Management and Competitiveness	
MGT 4191	The Entrepreneurship Forum	
MGT 4192	Impact Speaker Series Forum	
MGT 4193	Servant Leadership, Values & Systems	
MGT 4194	Social Enterprise and Entrepreneurship	
MGT 4303	Personal Selling and Sales Management	
MGT 4304	Strategic Brand Management	
MGT 4307	Strategic Marketing	
MGT 4335	International Marketing	
MGT 4610	Law, Management, and Economics	
MGT 4670	Entrepreneurship	
Free Electives		
Free Electives [3,4]		5
Total Credit Hours		**122**

[1] Students must complete two of the three lab categories listed below. Each lab should be taken concurrently with the associated lecture course when possible. If you choose to take all three lab courses, then the 3000-level course may count toward Biology Electives instead of the Core Lab requirement.

- Ecology or Problem-based Ecology lab: BIOS 2301 or BIOS 2311
- Genetics or Integrative Genetics lab: BIOS 2601 or BIOS 2611
- Cell and Molecular Biology lab: BIOS 3451

[2] Students are required to complete 21 credit hours of Biology electives defined as follows:

- 12 'depth' credit hours must be 3000-level or higher courses with 'BIOS' prefix, excluding BIOS 4694-BIOS 4699. BIOS courses that are cross-listed with other departments are included in these 12 depth credit hours.
- The remaining 3 'breadth' credit hours can be selected from: other BIOS 3000-level or higher courses, BIOS experiential learning courses*, and/or the list of approved courses offered in other departments**.
  - **Experiential learning courses include: BIOS 4695, BIOS 4697, BIOS 4699, and VIP courses (VIP courses must have a

Biological Sciences instructor). Additional experiential learning coursework may be used to fulfill Free Electives.

- **Approved breadth elective courses in other departments include 3000-level or higher BMED, CHEM, EAS, NEUR, MATH, PHYS, PSYC; EXCEPT the following: BMED 4699, BMED 4900-BMED 4903, CHEM 4601, CHEM 4699,CHEM 4901-CHEM 4903, EAS 4651, EAS 4699, EAS 4900, MATH 4080, MATH 4090, MATH 4699, MATH 4999, NEUR 4699, NEUR 4901, PHYS 4601, PHYS 4602, PHYS 4699, PSYC 4600, PSYC 4601, PSYC 4699, PSYC 4900-PSYC 4910.

[3] CETL 2000 may apply toward free electives.

[4] Pass-Fail allowed for Free Electives only. Refer to Institute Rules for maximum Pass-Fail Credits allowed.

Bachelor of Science in Biology - General

Effective Spring 2020: The School of Biological Sciences has transitioned all undergraduate Biology (BIOL) and Applied Physiology (APPH) courses to Biological Sciences (BIOS) to reflect the merger of the two Schools. Courses under the BIOL- and APPH- may still apply to these requirements. Students should consult with advisors to determine which requirements have been met.

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
or MATH 15	Calculus for Life Sciences	
Core B - Institutional Options		
Select one of the following:		3
CS 1301	Introduction to Computing	
CS 1315	Introduction to Media Computation	
CS 1371	Computing for Engineers	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
BIOS 1207 & 1207L	Biological Principles for Majors and Biological Principles Project Laboratory	4
or BIOS 110 & 1107L	Biological Principles and Biological Principles Laboratory	
CHEM 1211K	Chemical Principles I	4
CHEM 1212K	Chemical Principles II	4
CHEM 2311	Organic Chemistry I	3
CHEM 2312	Organic Chemistry II	3
or CHEM 23	Organic and Bioorganic Chemistry	
Major Requirements		
BIOS 1208 & 1208L	Organismal Biology for Majors and Organismal Biology Project Laboratory	4
or BIOS 110 & 1108L	Organismal Biology and Organismal Biology Laboratory	
BIOS 2300	Ecology	3
or BIOS 2310	Problems in Ecology	
BIOS 3450	Cell and Molecular Biology	3
BIOS 2600	Genetics	3
or BIOS 2610	Integrative Genetics	
Biology Lab [1]		2
BIOS 3600	Evolutionary Biology	3
BIOS 4460	Communicating Biological Research	1
Select one of the following:		3
BIOS 4590	Research Project Lab	
BIOS 4690	Independent Research Project	
Non-Biology Courses		
CHEM 2380	Synthesis Laboratory I	2
or CHEM 2380H	Synthesis Laboratory I	
Select one of the following:		3
BIOS 3400	Mathematical Models in Biology	
BIOS 4150	Genomics and Applied Bioinformatics	
BIOS 4401	Experimental Design and Statistical Methods in Biological Sciences	
Biology Electives		
Biology Electives 3000-level or higher [2]		21
Free Electives		
Free Electives [3,4]		11
Total Credit Hours		**122**

[1] Students must complete two of the three lab categories listed below. Each lab should be taken concurrently with the associated lecture course when possible. If you choose to take all three lab courses, then the 3000-level course may count toward Biology Electives instead of the Core Lab requirement.

- Ecology or Problem-based Ecology lab: BIOS 2301 or BIOS 2311
- Genetics or Integrative Genetics lab: BIOS 2601 or BIOS 2611
- Cell and Molecular Biology lab: BIOS 3451

[2] Students are required to complete 21 credit hours of Biology electives defined as follows:

- 12 'depth' credit hours must be 3000-level or higher courses with 'BIOS' prefix, excluding BIOS 4694-BIOS 4699. BIOS courses that are

cross-listed with other departments are included in these 12 depth credit hours.

- The remaining 9 'breadth' credit hours can be selected from: other BIOS 3000-level or higher courses, BIOS experiential learning courses*, and/or the list of approved courses offered in other departments**.
  - **Experiential learning courses include: BIOS 4695, BIOS 4697, BIOS 4699, and VIP courses (VIP courses must have a Biological Sciences instructor). A maximum of 6 credits of each experiential learning course may be used to fulfill 'breadth' credit hours. Additional experiential learning coursework may be used to fulfill Free Electives.
  - **Approved breadth elective courses in other departments include 3000-level or higher BMED, CHEM, EAS, NEUR, MATH, PHYS, PSYC; EXCEPT the following: BMED 4699, BMED 4900-BMED 4903, CHEM 4601, CHEM 4699,CHEM 4901-CHEM 4903, EAS 4651, EAS 4699, EAS 4900, MATH 4080, MATH 4090, MATH 4699, MATH 4999, NEUR 4699, NEUR 4901, PHYS 4601, PHYS 4602, PHYS 4699, PSYC 4600, PSYC 4601, PSYC 4699, PSYC 4900-PSYC 4910.

[3] CETL 2000 may be applied to free electives.
[4] Pass-Fail allowed for Free Electives only. Refer to Institute Rules for maximum Pass-Fail Credits allowed.

BACHELOR OF SCIENCE IN BIOMEDICAL ENGINEERING

The true integration of the life sciences and engineering is essential in educating a substantial percentage of the next generation of biomedical engineers in order to benefit from the biological revolution and its applications to medicine. This degree program attracts outstanding students who wish to have that integration in their undergraduate education, so that they may be equipped with the tools to be leaders in this field in the 21st Century.

The curriculum includes a solid foundation in fundamental engineering, mathematics, and sciences - biology, chemistry, and physics - as well as grounding in humanities, social sciences, and communication skills. A unique aspect of the curriculum is the incorporation of problem-based learning (PBL) methodologies to foster development of both self-directed learning skills and problem-solving skills in a team-based environment.

Program Educational Objectives

The program strives to produce graduates who are expected to demonstrate the following during the first few years after graduation:

1. mathematics, science, and engineering fundamentals expertise at the interface of engineering and the life sciences which enables them to take leadership roles in the field of biomedical engineering;
2. an ability to use their multidisciplinary background to foster communication across professional and disciplinary boundaries with the highest professional and ethical standards; and
3. the ability to recognize the limits of their knowledge and initiate self-directed learning opportunities to be able to continue to identify and create professional opportunities for themselves in the field of biomedical engineering.

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1371	Computing for Engineers	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [1]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
or MATH 155	Linear Algebra	
or MATH 155	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
BMED 1000	Introduction to Biomedical Engineering	1
BMED 2110	Conservation Principles in Biomedical Engineering	3
COE 2001	Statics	2
MATH 2551	Multivariable Calculus	4
MATH 2552	Differential Equations	4
CHEM 1211K	Chemical Principles I	4
Major Requirements		
BMED 2250	Problems in Biomedical Engineering	3
BMED 2310	Intro to Biomedical Engineering Design	3
BMED 3100	Systems Physiology	3
BMED 3110	Quantitative Engineering Physiology Laboratory I	2
BMED 3310	Biotransport	3
BMED 3410	Introduction to Biomechanics	3
BMED 3520	Biomedical Systems and Modeling	3
BMED 3600	Physiology of Cellular and Molecular Systems	3
BMED 3610	Quantitative Engineering Physiology Laboratory II	2
BMED 4000	The Art of Telling Your Story	1
BMED 4602	Capstone Design	3
or BMED 47	Interdisciplinary Capstone Design	
Other Engineering and Science Requirements		
CHEM 1315	Survey of Organic Chemistry for Engineers	3
CEE 3770	Statistics and Applications	3
or ISYE 3770	Statistics and Applications	
or BMED 2400	Introduction to Bioengineering Statistics	
MSE 2001	Principles and Applications of Engineering Materials	3
ECE 3710	Circuits and Electronics	2
ECE 3741	Instrumentation and Electronics Lab	1
BMED Depth Electives		
BMED Depth Electives [3]		12
BMED Breadth Electives		
BMED Breadth Electives [4]		15
Total Credit Hours		**131**

Pass-fail only allowed for Free Electives, Humanities, and Social Sciences.

Students must average a 2.0 for all BMED coursework required by name and number (includes BMED 1000 and BMED 2110)

Student must earn a 2.0 average
in MATH 1551, MATH 1552, MATH 1553, MATH 2551, and MATH 2552.

[1] If PHYS 2231 is taken, extra hour goes to Free Electives.

[2] If PHYS 2232 is taken, extra hour goes to Free Electives.
[3] BMED 2699, any 3000- or 4000-level BMED course. Maximum of six credit hours of undergraduate research.
[4] Breadth Electives can be satisfied with a minor, certificate, or other coursework. Please consult with advisor on course selection.

Cooperative Plan

The Georgia Tech Undergrad Co-op Program is a five-year, academic program designed to complement a student's formal education with paid practical work experience directly related to the student's academic major. It is available in all engineering majors, as well as in many majors in other colleges at Georgia Tech.

Co-ops alternate semesters of on-campus study with semesters of full-time employment through their junior year, then continue in school through their senior year. Co-ops are classified as full-time students during each term, regardless of whether they are attending classes on campus or working full-time at an employer location. Most undergrad Co-op students begin the program as freshmen or sophomores. With more than 2,700 students participating, Georgia Tech's program is currently the largest optional co-op program in the United States and has perennially been listed in U.S. News & World Report as one of the "Top Ten" co-op programs in America.

As an integral part of the overall education experience, the co-op program allows students to take on increasing levels of responsibility and to use their job knowledge and classroom learning to make meaningful contributions to the organizations in which they work. Many co-op graduates are hired by their co-op employer, and more than 700 companies or government organizations throughout the United States and abroad currently employ Georgia Tech Undergrad Co-op Program students.

To learn more about Biomedical Engineering Co-op opportunities at Georgia Tech, contact Rob Rogers. Rob is a Development Co-op Advisor with the Georgia Tech Center for Career Discovery and Development, and the point person for BME students. Rob is located in the Bill Moore Student Success Center, 1st Floor. His phone number is (404) 894-1348

International Plan

The International Plan is a challenging and coherent academic program for undergraduates that develops global competence within the context of a student's major. It is a degree-long program that integrates international studies and experiences into any participating major at Georgia Tech. It helps to prepare Georgia Tech graduates professionally and personally for successful lives in the twenty-first century.

The International Plan is not intended to replace current international programs; it supplements them. Existing study abroad opportunities continue to be offered. It is also not intended to be an add-on to the current degree programs. It is intended to be another curriculum path to earn a degree in which international competence is integrated into the program of study. The Plan can be completed within the normal timeframe of four years of undergraduate study.

The overarching model for the International Plan has four components:

1. International coursework: Three courses to include one from each of the following categories:
    a. International relations
    b. Global economics
    c. A course about a specific country or region
2. International experience: Two terms abroad (not less than 26 weeks) engaged in any combination of study abroad, research, or internship
3. Second language proficiency: All students in the program are expected to reach at least the proficiency level equivalent to two years of college-level language study. Students who use the language to study, conduct research, or participate in an internship during their international experience are expected to attain a higher level of proficiency. Language proficiency is determined by testing (not course credits).
4. Culminating course: A capstone course in the major designed to tie the international studies and experiences together with the student's major. The senior design project (i.e. BMED) will be used to satisfy this requirement. The design project must incorporate a significant element of the international experience (e.g. foreign client, location of work, project customers, motivation, regulatory issues, etc).

Completion of the International Plan is recognized by a designation on the student's diploma indicating completion of the degree with global competence.

For additional information about the International Plan visit www.oie.gatech.edu/internationalplan.

Research Option

The Research Option is intended for students who seek a concentrated research experience, culminating in an undergraduate thesis, integrated into their undergraduate studies in biomedical engineering. Students are strongly encouraged at the end of their experience to work with their faculty mentor to develop a journal publication or conference presentation on the research in addition to the actual thesis. Students who complete this option receive a designation on their transcript.

Students may be able to satisfy the additional requirements imposed for the Research Option designation through appropriate choices of electives without additional credit hours to complete the degree. The Research Option designation may be pursued separately, or in combination with the Cooperative Plan and/or the International Plan.

Research Option Requirements

1. Complete at least nine credit hours of undergraduate research (i.e. BMED 2698, BMED 2699, BMED 4698, or BMED 4699) spanning typically at least three terms. The research may be for either pay or credit, and at least six credit hours must be on the same research project, broadly defined.
2. Take the course LMC 4701, typically in the second semester of research. The research proposal outlining the research topic and project for the thesis will be written for this course. The proposal must be approved by a faculty advisor and one other faculty member.
3. Take the course LMC 4702 during the thesis-writing semester. The thesis documenting the results of the research will be written as part of this course. It must be approved by two faculty members and will be archived in the Georgia Tech Library.

BS/MS Option

Students completing both a bachelor's and master's in biomedical engineering at Georgia Tech may use up to six credit hours of graduate-

level coursework in the major discipline for both degrees. Students still must complete all other course requirements for both degrees.

Once admitted, a GPA of at least 3.0 must be maintained to remain in the program.

Up to six credit hours of engineering and data science courses from the approved lists for the MS BMED Program may be shared as depth electives with the BS BMED Program

BACHELOR OF SCIENCE IN BUILDING CONSTRUCTION

The Bachelor of Science in Building Construction (BSBC) gives students a complete view of the building life cycle, including design, construction and operation. Students learn technology-driven methods of construction management and critical leadership skills. The curriculum shows students how prefabrication, 3D printing, virtual and augmented reality, drones, and robotics can impact safety, profitability, and sustainability. It's the major for students who prefer the practical and tangible aspects of the built environment, incorporating perspectives of construction contractors, owners, and facility managers.

Curriculum

The BSBC program consists of 120 credit hours plus wellness. It includes five free electives that can be used for a minor, three professional electives, and a Capstone project. An entrepreneurial component to the curriculum teaches students business concepts and communication skills, preparing them for business ventures in construction or technologies.

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
PHYS 2211	Introductory Physics I	4
Lab Science Elective		4
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
ECON 2100	Economic Analysis and Policy Problems [1]	3
BC 2610	Construction Technology I	3
BC 2620	Construction Technology II	3
BC 2631	Introduction to Construction Management	2
BC 2632	Construction Materials and Methods	3
BC 2634	Construction Plans and Estimates	3
Major Requirements		
BC 2636	Construction Safety	3
BC 3600	Construction Cost Management	3
BC 3610	Construction Law	3
BC 3630	Project Management I	3
BC 3640	Construction Mechanics	3
BC 4050	Building Information Modeling for Multi-disciplinary Integration	3
BC 4130	Intg Design Constr & Dev	3
BC 4600	Project Management II	3
BC 4630	Senior Capstone Project	3
BC 4660	Entrepreneurship in Construction	3
BC 4672	Mechanical, Electrical and Plumbing Systems for Construction Managers	3
BC 4680	Professional Internship	3
BC 4710	Green Construction	3
MGT 2106	Legal, Social, Ethical Aspects of Business	3
MGT 3000	Financial and Managerial Accounting	3
MGT 3078	Finance and Investments	3
MGT 3101	Organizational Behavior	3
Free Electives		
Free Electives		9
Total Credit Hours		**122**

[1] ECON 2100 is preferred. See advisor for other options.

BACHELOR OF SCIENCE IN BUSINESS ADMINISTRATION

Students with an interest in business and management would profit from the Bachelor of Science in Business Administration (BSBA) degree program. The program builds upon knowledge of the functional, environmental, behavioral, and legal aspects of business and provides analytical and conceptual tools for analyzing complicated problems in the technological age. It prepares the student for business and managerial responsibilities and decision making. The large number of elective hours allows the student to tailor a program to their individual educational objectives.

Unlike other Colleges which require two years prior to declaring a major, Scheller College Undergraduate Program allows a student to selected a concentration (or have a very strong idea of which concentration you would like to pursue) by the end of their sophomore year. During their freshman and sophomore years, there are several resources available to aid in a concentration selection.

Students must complete a concentration of electives in one of the following areas:

Accounting

Finance

General Management

Information Technology Management

Leadership and Organizational Change

Marketing

Operations and Supply Chain Management

Strategy and Innovation

- Bachelor of Science in Business Administration - Accounting
- Bachelor of Science in Business Administration - Finance
- Bachelor of Science in Business Administration - General Management
- Bachelor of Science in Business Administration - IT Management
- Bachelor of Science in Business Administration - Leadership and Organizational Change
- Bachelor of Science in Business Administration - Marketing
- Bachelor of Science in Business Administration - Operations and Supply Chain Management
- Bachelor of Science in Business Administration - Strategy and Innovation

Bachelor of Science in Business Administration - Accounting

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
or MATH 17	Survey of Calculus	
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1551 & MATH 1553	Differential Calculus and Introduction to Linear Algebra	4
or MATH 17	Finite Mathematics	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
ECON 2105	Principles of Macroeconomics	3
ECON 2106	Principles of Microeconomics	3
Any SS		3
Core F - Courses Related to Major		
ACCT 2101	Accounting I: Financial Accounting	3
ACCT 2102	Accounting II: Managerial Accounting	3
MGT 2106	Legal, Social, Ethical Aspects of Business	3
MGT 2210	Information Systems and Digital Transformation	3
MGT 2250	Management Statistics	3
MGT 2255	Quantitative Analysis for Business	3
Major Requirements		
LMC 3403	Technical Communication, Theory and Practice	3
MGT 3062	Financial Management	3
MGT 3101	Organizational Behavior	3
MGT 3102	Managing Human Resources within a Regulatory Environment	3
MGT 3300	Marketing Management I	3
MGT 3501	Operations Management	3
MGT 3599	Career Development Workshop	1

MGT 3660	International Business	3
MGT 3659	Foundations of Strategy	3
Accounting Concentration		
MGT 4010	Business Taxation [3]	3
MGT 4026	Financial Reporting and Analysis I [3]	3
MGT 4027	Financial Reporting and Analysis II [3]	3
MGT 4041	Auditing and Financial Control Systems [3]	3
Select two of the following: [3,4]		6
MGT 4015	Advanced Managerial Accounting	
MGT 4028	Financial Analysis and Reporting of Technology Firms	
MGT 4030	International Accounting	
MGT 4043	Advanced Financial Reporting	
MGT 4045	Seminar in Advanced Accounting	
MGT 4047	Ethics & Accounting	
Non-MGT Electives		
Non-MGT Electives [1]		6
Free Electives		
Free Electives [2]		10
Total Credit Hours		**122**

Pass-fail only allowed for Free Electives.

1. Any courses except for MGT or ACCT.
2. Maximum 3 credit hours of internship; Maximum 9 credit hours of undergraduate research; Maximum 3 credit hours of Special Problems/Independent Study.
3. Minimum grade of C required.
4. Consult your Academic Advisor for approval to use one Special Problems MGT 4910 course (3 credit hours) for a concentration elective. Course must be taught by a College of Business Accounting faculty member.

Bachelor of Science in Business Administration - Finance

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
or MATH 17	Survey of Calculus	
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1551 & MATH 1553	Differential Calculus and Introduction to Linear Algebra	4
or MATH 17	Finite Mathematics	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
ECON 2105	Principles of Macroeconomics	3
ECON 2106	Principles of Microeconomics	3
Any SS		3
Core F - Courses Related to Major		
ACCT 2101	Accounting I: Financial Accounting	3
ACCT 2102	Accounting II: Managerial Accounting	3
MGT 2106	Legal, Social, Ethical Aspects of Business	3
MGT 2210	Information Systems and Digital Transformation	3
MGT 2250	Management Statistics	3
MGT 2255	Quantitative Analysis for Business	3
Major Requirements		
LMC 3403	Technical Communication, Theory and Practice	3
MGT 3062	Financial Management	3
MGT 3101	Organizational Behavior	3
MGT 3102	Managing Human Resources within a Regulatory Environment	3
MGT 3300	Marketing Management I	3
MGT 3501	Operations Management	3
MGT 3599	Career Development Workshop	1
MGT 3660	International Business	3
MGT 3659	Foundations of Strategy	3
Finance Concentration		
MGT 3076	Investments [3]	3
MGT 3079	Management of Financial Institutions [3]	3
MGT 4070	International Finance [3]	3
MGT 4067	Financial Markets: Trading and Structure [3]	3
Select two of the following: [3,4]		6
MGT 3075	Security Valuation	
MGT 3082	Fundamentals of Real Estate Development	
MGT 3084	Derivative Securities	
MGT 4026	Financial Reporting and Analysis I	
MGT 4066	Corporate Restructuring	
MGT 4068	Fixed Income	
MGT 4072	Entrepreneurial Finance	
Non-MGT Electives		
Non-MGT Electives [1]		6
Free Electives		
Free Electives [2]		10
Total Credit Hours		**122**

Pass-fail only allowed for Free Electives.

1 Any courses except for MGT or ACCT.

2 Maximum 3 credit hours of internship; Maximum 9 credit hours of undergraduate research; Maximum 3 credit hours of Special Problems/Independent Study.

3 Minimum grade of C required.

4 Consult your Academic Advisor for approval to use one Special Problems MGT 4910 course (3 credit hours) for a concentration elective. Course must be taught by a College of Business Finance faculty member.

Bachelor of Science in Business Administration - General Management

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
or MATH 17	Survey of Calculus	
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1551 & MATH 1553	Differential Calculus and Introduction to Linear Algebra	4
or MATH 17	Finite Mathematics	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
ECON 2105	Principles of Macroeconomics	3
ECON 2106	Principles of Microeconomics	3
Any SS		3
Core F - Courses Related to Major		
ACCT 2101	Accounting I: Financial Accounting	3
ACCT 2102	Accounting II: Managerial Accounting	3
MGT 2106	Legal, Social, Ethical Aspects of Business	3
MGT 2210	Information Systems and Digital Transformation	3
MGT 2250	Management Statistics	3
MGT 2255	Quantitative Analysis for Business	3
Major Requirements		
LMC 3403	Technical Communication, Theory and Practice	3
MGT 3062	Financial Management	3
MGT 3101	Organizational Behavior	3
MGT 3102	Managing Human Resources within a Regulatory Environment	3
MGT 3300	Marketing Management I	3
MGT 3501	Operations Management	3
MGT 3599	Career Development Workshop	1
MGT 3660	International Business	3
MGT 3659	Foundations of Strategy	3
General Management Concentration		
Select six of the following: [1,2,3,6]		18
MGT 3075	Security Valuation	
MGT 3076	Investments	
MGT 3079	Management of Financial Institutions	
MGT 3082	Fundamentals of Real Estate Development	
MGT 3084	Derivative Securities	
MGT 3103	Leadership in a Changing Environment	
MGT 3310	Marketing Research: Analytics	
MGT 3510	Management of Technology	
MGT 3605	Principles of Commerical Law	
MGT 3606	International Business Law	
MGT 3607	Business Ethics	
MGT 3608	Technology Law and Ethics	
MGT 3609	Legal Aspects of Real Estate	
MGT 3661	Advanced Concepts in International Business	
MGT 3662	Management in the Healthcare Sector	
MGT 3663	Technology Strategy	
MGT 3743	Analysis of Emerging Technologies	
MGT 3744	Managing Product, Service & Technology Development	
MGT 4010	Business Taxation	
MGT 4015	Advanced Managerial Accounting	
MGT 4026	Financial Reporting and Analysis I	
MGT 4027	Financial Reporting and Analysis II	
MGT 4028	Financial Analysis and Reporting of Technology Firms	
MGT 4030	International Accounting	
MGT 4041	Auditing and Financial Control Systems	
MGT 4043	Advanced Financial Reporting	
MGT 4045	Seminar in Advanced Accounting	
MGT 4047	Ethics & Accounting	
MGT 4052	Systems Analysis and Design	
MGT 4053	Business Data Communications	
MGT 4056	Electronic Commerce	
MGT 4057	Business Process Analysis and Design	
MGT 4058	Database Management Systems	
MGT 4066	Corporate Restructuring	

MGT 4067	Financial Markets: Trading and Structure	
MGT 4068	Fixed Income	
MGT 4070	International Finance	
MGT 4072	Entrepreneurial Finance	
MGT 4102	Management Consulting	
MGT 4116	The Role of Gender, Race and Ethnicity in Organizational Behavior	
MGT 4191	The Entrepreneurship Forum	
MGT 4192	Impact Speaker Series Forum	
MGT 4193	Servant Leadership, Values & Systems	
MGT 4194	Social Enterprise and Entrepreneurship	
MGT 4303	Personal Selling and Sales Management	
MGT 4304	Strategic Brand Management	
MGT 4308	Advertising & Promotion: Integrated Marketing Communications	
MGT 4309	Services Marketing	
MGT 4311	Digital Marketing	
MGT 4331	Consumer Behavior	
MGT 4332	Database and CRM Strategy	
MGT 4335	International Marketing	
MGT 4352	Operations Resource Planning and Execution	
MGT 4353	Operations Strategy	
MGT 4360	Global Operations and Supply Chain Management	
MGT 4366	Service Operations Management	
MGT 4401	Supply Chain Modeling	
MGT 4670	Entrepreneurship	
MGT 4803	Special Topics in Management	
MGT 4910	Special Problems	
Non-MGT Electives		
Non-MGT Electives [4]		6
Free Electives		
Free Electives [5]		10
Total Credit Hours		**122**

Pass-fail only allowed for Free Electives.

1. MGT 4803 must have a title of Business Analytics, or Business Forecasting, or Business and Government Regulation, or Business Programming, or Corporate Governance, or Employment, Benefits, and Compensation Law, or Innovation and Entrepreneurial Behavior, or International HR, or Law for Entrepreneurs, or Leadership: Managing Professionals, or Management of Healthcare Operations, or Legal Issues in Sports Management or Managerial Economics, or Motivation and Rewards, or Project Management, or Sales Management.
2. Students may not use both MGT 4191 and MGT 4192 towards the General Management Concentration
3. Minimum grade of C required.
4. Any courses except for MGT or ACCT.
5. Maximum 3 credit hours of internship; Maximum 9 credit hours of undergraduate research; Maximum 3 credit hours of Special Problems/ Independent Study.
6. Complete five classes from five different clusters. Complete one additional class from any cluster.

Bachelor of Science in Business Administration - Information Technology Management

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
or MATH 17	Survey of Calculus	
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1551 & MATH 1553	Differential Calculus and Introduction to Linear Algebra	4
or MATH 17	Finite Mathematics	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
ECON 2105	Principles of Macroeconomics	3
ECON 2106	Principles of Microeconomics	3
Any SS		3
Core F - Courses Related to Major		
ACCT 2101	Accounting I: Financial Accounting	3
ACCT 2102	Accounting II: Managerial Accounting	3
MGT 2106	Legal, Social, Ethical Aspects of Business	3
MGT 2210	Information Systems and Digital Transformation	3
MGT 2250	Management Statistics	3
MGT 2255	Quantitative Analysis for Business	3
Major Requirements		
LMC 3403	Technical Communication, Theory and Practice	3
MGT 3062	Financial Management	3
MGT 3101	Organizational Behavior	3
MGT 3102	Managing Human Resources within a Regulatory Environment	3
MGT 3300	Marketing Management I	3

MGT 3501	Operations Management	3
MGT 3599	Career Development Workshop	1
MGT 3660	International Business	3
MGT 3659	Foundations of Strategy	3
IT Management Concentration		
Select three of the following: [3,5]		9
MGT 3745	Business Programming	
MGT 4052	Systems Analysis and Design	
MGT 4058	Database Management Systems	
MGT 4450	Project Management	
Select three of the following: [1,3,6,7]		9
MGT 3103	Leadership in a Changing Environment	
MGT 3310	Marketing Research: Analytics	
MGT 3663	Technology Strategy	
MGT 3742	Spreadsheet Modeling for Business Decision Support	
MGT 3743	Analysis of Emerging Technologies	
MGT 3744	Managing Product, Service & Technology Development	
MGT 4041	Auditing and Financial Control Systems	
MGT 4050	Business Analytics	
MGT 4053	Business Data Communications	
MGT 4056	Electronic Commerce	
MGT 4057	Business Process Analysis and Design	
MGT 4102	Management Consulting	
MGT 4119	Leading Teams in Organizations	
MGT 4193	Servant Leadership, Values & Systems	
MGT 4311	Digital Marketing	
MGT 4341	Management of Healthcare Operations	
MGT 4352	Operations Resource Planning and Execution	
MGT 4360	Global Operations and Supply Chain Management	
MGT 4366	Service Operations Management	
MGT 4670	Entrepreneurship	
MGT 4725	Information Security Strategies and Policy	
MGT 4726	Privacy, Technology, Policy, and Law	
MGT 4803	Special Topics in Management	
CS 3251	Computer Networking I	
CS 4235	Introduction to Information Security	
VIP 2601	Vertically Integrated Project: Multidisciplinary project-based team, sophomore level	
VIP 3601	Vertically Integrated Project: Multidisciplinary project-based team, junior level	
VIP 3602	Vertically Integrated Project: Multidisciplinary project-based team, junior level	
VIP 4601	Vertically Integrated Project: Multidisciplinary project-based team, senior level	
VIP 4602	Vertically Integrated Project: Multidisciplinary project-based team, senior participation	
Non-MGT Electives		
Non-MGT Electives [2]		6
Free Electives		
Free Electives [4]		10
Total Credit Hours		**122**

Pass-fail only allowed for Free Electives.

1. MGT 4803 must have a title of Data Visualization for Business or Social and Digital Analytics.
2. Any courses except for MGT or ACCT.
3. Minimum grade of C required.
4. Maximum 3 credit hours of internship; Maximum 9 credit hours of undergraduate research; Maximum 3 credit hours of Special Problems/ Independent Study.
5. Students may apply unused Group A elective courses toward Group B electives
6. Students must complete 3 credit hours of VIP courses pre-approved by an academic advisor.
7. Only 3 credit hours of VIP courses may be used towards Group B electives.

Bachelor of Science in Business Administration - Leadership and Organizational Change

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
or MATH 17	Survey of Calculus	
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1551 & MATH 1553	Differential Calculus and Introduction to Linear Algebra	4
or MATH 17	Finite Mathematics	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
ECON 2105	Principles of Macroeconomics	3

ECON 2106	Principles of Microeconomics	3
Any SS		3
Core F - Courses Related to Major		
ACCT 2101	Accounting I: Financial Accounting	3
ACCT 2102	Accounting II: Managerial Accounting	3
MGT 2106	Legal, Social, Ethical Aspects of Business	3
MGT 2210	Information Systems and Digital Transformation	3
MGT 2250	Management Statistics	3
MGT 2255	Quantitative Analysis for Business	3
Major Requirements		
LMC 3403	Technical Communication, Theory and Practice	3
MGT 3062	Financial Management	3
MGT 3101	Organizational Behavior	3
MGT 3102	Managing Human Resources within a Regulatory Environment	3
MGT 3300	Marketing Management I	3
MGT 3501	Operations Management	3
MGT 3599	Career Development Workshop	1
MGT 3660	International Business	3
MGT 3659	Foundations of Strategy	3
Leadership and Organizational Change Concentration		
Select four of the following: [1,3]		12
MGT 3103	Leadership in a Changing Environment	
MGT 3118	Cross-cultural Management	
MGT 3607	Business Ethics	
MGT 4102	Management Consulting	
MGT 4117	Global Workforce Management	
MGT 4119	Leading Teams in Organizations	
MGT 4803	Special Topics in Management	
Select two of the following: [2,3]		6
MGT 3744	Managing Product, Service & Technology Development	
MGT 4116	The Role of Gender, Race and Ethnicity in Organizational Behavior	
MGT 4192	Impact Speaker Series Forum	
MGT 4193	Servant Leadership, Values & Systems	
MGT 4194	Social Enterprise and Entrepreneurship	
MGT 4670	Entrepreneurship	
MGT 4803	Special Topics in Management	
Non-MGT Electives		
Non-MGT Electives [4]		6
Free Electives		
Free Electives [5]		10
Total Credit Hours		**122**

Pass-fail only allowed for Free Electives.

1. MGT 4803 must have a title of Innovation and Entrepreneurial Behavior, or Leadership: Managing Professionals, or Motivation and Rewards or Strategic Management of Human Assets.
2. MGT 4803 must have a title of Employment, Benefits, and Compensation Law.
3. Minimum grade of C required.
4. Any courses except for MGT or ACCT.
5. Maximum 3 credit hours of internship; Maximum 9 credit hours of undergraduate research; Maximum 3 credit hours of Special Problems/ Independent Study.

Bachelor of Science in Business Administration - Marketing

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
Core B - Institutional Options		
MATH 1552	Integral Calculus	4
or MATH 17	Survey of Calculus	
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1551 & MATH 1553	Differential Calculus and Introduction to Linear Algebra	4
or MATH 17	Finite Mathematics	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
ECON 2105	Principles of Macroeconomics	3
ECON 2106	Principles of Microeconomics	3
Any SS		3
Core F - Courses Related to Major		
ACCT 2101	Accounting I: Financial Accounting	3
ACCT 2102	Accounting II: Managerial Accounting	3
MGT 2106	Legal, Social, Ethical Aspects of Business	3
MGT 2210	Information Systems and Digital Transformation	3
MGT 2250	Management Statistics	3
MGT 2255	Quantitative Analysis for Business	3
Major Requirements		
LMC 3403	Technical Communication, Theory and Practice	3
MGT 3062	Financial Management	3
MGT 3101	Organizational Behavior	3

MGT 3102	Managing Human Resources within a Regulatory Environment	3
MGT 3300	Marketing Management I	3
MGT 3501	Operations Management	3
MGT 3599	Career Development Workshop	1
MGT 3660	International Business	3
MGT 3659	Foundations of Strategy	3
Marketing Concentration		
Select three of the following (Group A): [1,2]		9
MGT 3310	Marketing Research: Analytics	
MGT 4311	Digital Marketing	
MGT 4345	Marketing Practicum	
MGT 4803	Special Topics in Management	
Concentration Electives [1,3,4,5]		
Group B:		9
MGT 3312	Pricing Strategy and Analytics	
MGT 3313	Social Media Marketing	
MGT 3325	Product Planning	
MGT 4303	Personal Selling and Sales Management	
MGT 4304	Strategic Brand Management	
MGT 4308	Advertising & Promotion: Integrated Marketing Communications	
MGT 4309	Services Marketing	
MGT 4331	Consumer Behavior	
MGT 4335	International Marketing	
MGT 4803	Special Topics in Management	
Group C:		
MGT 3744	Managing Product, Service & Technology Development	
MGT 4050	Business Analytics	
MGT 4367	Revenue Analytics	
Non-MGT Electives		
Non-MGT Electives [6]		6
Free Electives		
Free Electives [7]		10
Total Credit Hours		**122**

Pass-fail only allowed for Free Electives.

1. C-minimum required
2. MGT 4803 must have title of Marketing Research: Tools and Design.
3. MGT 4803 must have title of Understanding Markets with Data Science or Sustainable Marketing
4. Students must select one of two options: (1) they may select 9 credit hours of coursework from Group B or (2) select 6 credit hours of coursework from Group B and 3 credit hours of coursework from Group C
5. Students may apply unused Group A elective courses toward Group B electives
6. Any courses except for MGT or ACCT
7. Maximum 3 credit hours of internship; Maximum 9 credit hours of undergraduate research; Maximum 3 credit hours of Special Problems/ Independent Study

Bachelor of Science in Business Administration - Operations and Supply Chain Management

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
or MATH 17	Survey of Calculus	
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1551 & MATH 1553	Differential Calculus and Introduction to Linear Algebra	4
or MATH 17	Finite Mathematics	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
ECON 2105	Principles of Macroeconomics	3
ECON 2106	Principles of Microeconomics	3
Any SS		3
Core F - Courses Related to Major		
ACCT 2101	Accounting I: Financial Accounting	3
ACCT 2102	Accounting II: Managerial Accounting	3
MGT 2106	Legal, Social, Ethical Aspects of Business	3
MGT 2210	Information Systems and Digital Transformation	3
MGT 2250	Management Statistics	3
MGT 2255	Quantitative Analysis for Business	3
Major Requirements		
LMC 3403	Technical Communication, Theory and Practice	3
MGT 3062	Financial Management	3
MGT 3101	Organizational Behavior	3
MGT 3102	Managing Human Resources within a Regulatory Environment	3
MGT 3300	Marketing Management I	3

MGT 3501	Operations Management	3
MGT 3599	Career Development Workshop	1
MGT 3660	International Business	3
MGT 3659	Foundations of Strategy	3
Operations and Supply Chain Management Concentration		
Select four of the following: [3]		12
MGT 3510	Management of Technology	
MGT 3744	Managing Product, Service & Technology Development	
MGT 4352	Operations Resource Planning and Execution	
MGT 4353	Operations Strategy	
MGT 4360	Global Operations and Supply Chain Management	
MGT 4366	Service Operations Management	
MGT 4401	Supply Chain Modeling	
Select two of the following: [1,3,5]		6
MGT 3743	Analysis of Emerging Technologies	
MGT 4056	Electronic Commerce	
MGT 4057	Business Process Analysis and Design	
MGT 4193	Servant Leadership, Values & Systems	
MGT 4309	Services Marketing	
MGT 4670	Entrepreneurship	
MGT 4803	Special Topics in Management	
Non-MGT Electives		
Non-MGT Electives [2]		6
Free Electives		
Free Electives [4]		10
Total Credit Hours		**122**

Pass-fail only allowed for Free Electives.

1 MGT 4803 must have title of Management of Healthcare Operations.
2 Any courses except for MGT or ACCT.
3 Minimum grade of C required.
4 Maximum 3 credit hours of internship; Maximum 9 credit hours of undergraduate research; Maximum 3 credit hours of Special Problems/ Independent Study.
5 Consult your Academic Advisor for approval to use one Special Problems MGT 4910 course (3 credit hours) for a concentration elective. Course must be taught by a College of Business Operations faculty member.

Bachelor of Science in Business Administration – Strategy and Innovation

Bachelor of Science in Chemical and Biomolecular Engineering - Biotechnology Option

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [3]	4
Core B - Institutional Options		
CS 1371	Computing for Engineers	3
Core C- Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [1]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [3]	2
MATH 1553	Introduction to Linear Algebra [3]	2
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
BIOS 1107 & 1107L	Biological Principles and Biological Principles Laboratory	4
CHEM 1211K	Chemical Principles I	4
or CHEM 131	Principles of General Chemistry for Engineers	
CHEM 2380	Synthesis Laboratory I	2
MATH 2551	Multivariable Calculus [3]	4
MATH 2552	Differential Equations [3]	4
Major Requirements		
CHBE 2100	Chemical Process Principles [3]	3
CHBE 2140	Chemical Engineering Thermodynamics [3]	4
CHBE 3205	Fluid Mechanics [3]	2
CHBE 3215	Heat & Mass Transfer [3]	4
CHBE 3225	Separations Processes [3]	3
CHBE 3300	Chemical Kinetics and Catalysis [3]	2
CHBE 4200	Transport Phenomena/Unit Operations Laboratory [3]	3
CHBE 4310	Bioprocess Engineering	3
CHBE 4320	Reactor Design [3]	2
CHBE 4411	Process Dynamics and Control [3]	3
CHBE 4412	Process Dynamics and Control Laboratory [3]	1
CHBE 4510	Process and Product Design And Economics [3]	2
CHBE 4515	Chemical Process Safety [3]	1
CHBE 4530	Capstone ChBE Bio-Design	2
CHBE Electives		
CHBE Electives [5]		3
Biotechnology Electives		
Biotechnology electives [6]		3
Engineering Electives		
Other Engineering and Science Requirements		
BIOS 3450	Cell and Molecular Biology	3
CHEM 1212K	Chemical Principles II	4
CHEM 2311	Organic Chemistry I	3
CHEM 2312	Organic Chemistry II	3
or CHEM 2303	Organic and Bioorganic Chemistry	
CHEM 3521	Biochemistry I	3
CHEM 3522	Biochemistry II	3
MSE 2001	Principles and Applications of Engineering Materials	3
Free Electives [7]		
Free Electives		3
Total Credit Hours		**129**

Pass-fail only allowed for Free Electives, Humanities Electives, and undesignated Social Sciences Electives.

1 If PHYS 2231 is taken, extra hour goes to Free Electives.

2 If PHYS 2232 is taken, extra hour goes to Free Electives.

3 Minimum grade of C required

4 CHBE Electives must be chosen from the following list: CHBE 4020, CHBE 4030, CHBE 4050, CHBE 4310, CHBE 4535, CHBE 4610, CHBE 4710, CHBE 4720, CHBE 4730, CHBE 4743, CHBE 4745, CHBE 4746, CHBE 4757, CHBE 4759, CHBE 4760, CHBE 4762, CHBE 4765, CHBE 4775, CHBE 4776, CHBE 4782, CHBE 4791, CHBE 4793 or any 6000-level CHBE course or higher. Special Topics or Special Problems courses must be approved by the ChBE Academic Committee.

5 Students should consult with their advisor regarding Engineering Elective options. Engineering electives must be chosen from the following list: AE 4699, AE 4883, BMED 2400, BMED 3400, BMED 3510, BMED 4699, BMED 4751, CEE 2040, CEE 2300, CEE 4330, CEE 4620, CEE 4699, CHBE 2699, CHBE 4020, CHBE 4030, CHBE 4050, CHBE 4310, CHBE 4535, CHBE 4610, CHBE 4699, CHBE 4710, CHBE 4720, CHBE 4730, CHBE 4743, CHBE 4757, CHBE 4759, CHBE 4760, CHBE 4762, CHBE 4765, CHBE 4767, CHBE 4775, CHBE 4776, CHBE 4782, CHBE 4791, CHBE 4793, CHBE 6120, CHBE 6794, COE 2001, COE 3001, COE 3002, ECE 2020, ECE 2026, ECE 3025, ECE 3040, ECE 3043, ECE 3072, ECE 3080, ECE 3710, ECE 3741, ECE 4350, ECE 4699, ISYE 2027, ISYE 2028, ISYE 3025, ISYE 3039, ISYE 3232, ME 2202, ME 3210, ME 4699, MSE 2021, MSE 3005, MSE 3720, MSE 4140, MSE 4751, MSE 4330, MSE 4740, MSE 4699,

NRE 3301, NRE 4610, NRE 4699. Special Topics or Special Problems courses must be approved by the ChBE Academic Committee.

6 PHYS 2XXX (AP credit) not allowed.

7 Five or fewer VIP credits can be applied as Free Electives. For Six or more VIP credits, approval must be granted by the ChBE Academic Committee to apply up to 3 hours as Engineering Electives; the balance will be applied as Free Electives. Please consult with your academic advisor for more details.

Bachelor of Science in Chemical and Biomolecular Engineering - Standard Option

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [3]	4
Core B - Institutional Options		
CS 1371	Computing for Engineers	3
Core C- Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [1]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [3]	2
MATH 1553	Introduction to Linear Algebra [3]	2
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
BIOS 1107 & 1107L	Biological Principles and Biological Principles Laboratory	4
CHEM 1211K	Chemical Principles I	4
or CHEM 131P	Principles of General Chemistry for Engineers	
CHEM 2380	Synthesis Laboratory I	2
MATH 2551	Multivariable Calculus [3]	4
MATH 2552	Differential Equations [3]	4
Major Requirements		
CHBE 2100	Chemical Process Principles [3]	3
CHBE 2140	Chemical Engineering Thermodynamics	4
CHBE 3205	Fluid Mechanics	2
CHBE 3215	Heat & Mass Transfer	4
CHBE 3225	Separations Processes [3]	3
CHBE 3300	Chemical Kinetics and Catalysis	2
CHBE 4200	Transport Phenomena/Unit Operations Laboratory [3]	3
CHBE 4320	Reactor Design	2
CHBE 4411	Process Dynamics and Control [3]	3
CHBE 4412	Process Dynamics and Control Laboratory [3]	1
CHBE 4510	Process and Product Design And Economics [3]	2
CHBE 4515	Chemical Process Safety [3]	1
CHBE 4520	Chemical Engineering Capstone Design Project [3]	2
CHBE Electives		
CHBE Electives [4]		6
Engineering Electives		
2000-level Engineering Elective or higher [5]		3
3000-level Engineering Elective or higher [5]		3
Other Engineering and Science Requirements		
CHEM 1212K	Chemical Principles II	4
CHEM 2311	Organic Chemistry I	3
CHEM 2312	Organic Chemistry II	3
or CHEM 2303	Organic and Bioorganic Chemistry	
MSE 2001	Principles and Applications of Engineering Materials	3
Select one of the following:		3
CHEM 3111	Inorganic Chemistry	
CHEM 3281	Instrumental Analysis for Engineers	
CHEM 3412	Physical Chemistry II	
CHEM 3511	Survey of Biochemistry	
CHEM 3521	Biochemistry I	
CHEM 3522	Biochemistry II	
CHEM 4311	Advanced Organic Chemistry	
CHEM 4341	Applied Spectroscopy	
Free Electives [7]		
Free Electives		6
Total Credit Hours		**129**

Pass-fail only allowed for Free Electives, Humanities Electives, and undesignated Social Sciences Electives.

1 If PHYS 2231 is taken, extra hour goes to Free Electives.

2 If PHYS 2232 is taken, extra hour goes to Free Electives.

3 Minimum grade of C required

4 CHBE Electives must be chosen from the following list: CHBE 4020, CHBE 4030, CHBE 4050, CHBE 4310, CHBE 4535, CHBE 4610, CHBE 4710, CHBE 4720, CHBE 4730, CHBE 4743, CHBE 4745, CHBE 4746, CHBE 4757, CHBE 4759, CHBE 4760, CHBE 4762, CHBE 4765, CHBE 4775, CHBE 4776, CHBE 4782, CHBE 4791, CHBE 4793 or any 6000-level CHBE course or higher. Special Topics or

Special Problems courses must be approved by the ChBE Academic Committee.

5 Students should consult with their advisor regarding Engineering Elective options. Engineering electives must be chosen from the following list: AE 4699, AE 4883, BMED 2400, BMED 3400, BMED 3510, BMED 4699, BMED 4751, CEE 2040, CEE 2300, CEE 4330, CEE 4620, CEE 4699, CHBE 2699, CHBE 4020, CHBE 4030, CHBE 4050, CHBE 4310, CHBE 4535, CHBE 4610, CHBE 4699, CHBE 4710, CHBE 4720, CHBE 4730, CHBE 4743, CHBE 4745, CHBE 4746 CHBE 4757, CHBE 4759, CHBE 4760, CHBE 4762, CHBE 4765, CHBE 4767, CHBE 4775, CHBE 4776, CHBE 4782, CHBE 4791, CHBE 4793, CHBE 6120, CHBE 6794, COE 2001, COE 3001, COE 3002, ECE 2020, ECE 2026, ECE 3025, ECE 3040, ECE 3043, ECE 3072, ECE 3080, ECE 3710, ECE 3741, ECE 4350, ECE 4699, ISYE 2027, ISYE 2028, ISYE 3025, ISYE 3039, ISYE 3232, ME 2202, ME 3210, ME 4699, MSE 2021, MSE 3005, MSE 3720, MSE 4140, MSE 4751, MSE 4330, MSE 4740, MSE 4699, NRE 3301, NRE 4610, NRE 4699. Special Topics or Special Problems courses must be approved by the ChBE Academic Committee.

6 PHYS 2XXX (AP credit) not allowed.

7 Five or fewer VIP credits can be applied as Free Electives. For Six or more VIP credits, approval must be granted by the ChBE Academic Committee to apply up to 3 hours as Engineering Electives; the balance will be applied as Free Electives. Please consult with your academic advisor for more details.

BACHELOR OF SCIENCE IN CHEMISTRY

The School of Chemistry and Biochemistry has a vibrant program of study leading to a Bachelor of Science in Chemistry. The flexibility of the curriculum allows students to study fundamental areas of chemistry while tailoring their degree with technical and free electives to produce a well-rounded experience in preparation for a variety of career opportunities. Students may pursue tailored tracks towards the B.S. in Chemistry, including those allowing specialization in: pre-health science, biochemistry, business, and a polymers and materials option. There are also many opportunities to gain research experience while working with world class research groups. In addition to coursework, students in the program often participate in a variety of experiential programs, including: undergraduate research, cooperative work, study abroad, summer internships, and serving as an undergraduate teaching assistant.

Faculty in the school are committed to undergraduate education and several have won awards for excellence in teaching. With a faculty to undergraduate student ratio of approximately 1:9, the School prides itself on the close contact that it maintains with its undergraduate students. The high quality of the curriculum and faculty is part of the reason chemistry graduates receive job offers at the highest salary levels for B.S. chemists. Graduates with a B.S. in Chemistry pursue careers such diverse field as forensics, environmental science, biotechnology, and pharmaceuticals in industry or governmental organizations; or they may continue their education in the chemical or biological sciences, or in medicine, pharmacy, dentistry, and law. Chemistry, especially with the biochemistry option (or the stand-alone Bachelor of Science in Biochemistry degree), is a superb preparation for medical school.

Chemistry Website

- Bachelor of Science in Chemistry - General
- Bachelor of Science in Chemistry - Biochemistry Option
- Bachelor of Science in Chemistry - Business Option
- Bachelor of Science in Chemistry - Polymers and Materials Option
- Bachelor of Science in Chemistry - Pre-health Option

International Plan

The BS in Chemistry (International Plan) and BS in Biochemistry (International Plan) are offered to undergraduate students seeking to understand their majors in a global perspective. Students in this program must demonstrate proficiency in a foreign language; complete coursework in a country/regional elective, international relations, and global economics; and participate in a study or research abroad experience (usually in the junior year). If a student is pursuing a research abroad experience, they are required to complete a supervised research experience with a faculty member in chemistry or biochemistry at the host institution. Upon successful completion of degree requirements for the International Plan, a "International Plan" designator is indicated on the diploma. If interested in participating in the International Plan as part of the BS in Chemistry or BS in Biochemistry, students should visit: www.internationalplan.gatech.edu.

Chemistry Website

Research Option

The BS in Chemistry (Research Option) and BS in Biochemistry (Research Option) are offered for students who wish to participate in a research project under the supervision of one of the fifty members of faculty and adjunct faculty in the School. Participants in the Research Option learn how to address a research problem from experiment design and execution to interpretation of results. There is an expectation that undergraduates who contribute to completed studies will be co-authors on submissions to high-quality scholarly journals. Research projects are available in the traditional areas of chemistry (analytical, biological, inorganic, organic, and physical chemistry) as well as highly interdisciplinary research areas, such as nanochemistry, polymer and materials chemistry, environmental chemistry and sensors, medicinal chemistry, molecular biophysics, and computational chemistry.

To pursue the Research Option in the School of Chemistry and Biochemistry, students should obtain a research project with a faculty member in the department and apply online via www.undergradresearch.gatech.edu. Successful completion of the Research Option requires the following:

Code	Title	Credit Hours
Select one of the following research options: [1]		9
CHEM 4698/4699	Undergraduate Research Assistantship	
LMC 4701	Undergraduate Research Proposal Writing (complete during the first or second semester of research) [2]	1
LMC 4702	Undergraduate Research Thesis Writing (take during the term in which students complete their thesis) [3]	1
Total Credit Hours		**11**

1 supervised research with faculty over three or more semesters
2 approval of proposal on project by a committee of two or more faculty
3 submission of an approved thesis

Successful completion of the Research Option is noted on the student's transcript. Students completing this option often pursue graduate studies in the chemical or biological sciences or research careers in industrial or governmental laboratories.

Chemistry Website

BSMS Option

The BSMS Option allows eligible students to double count a maximum of 6 credit hours toward undergraduate and graduate requirements while still completing all other program requirements to earn both degrees. The credit must be approved coursework (4000-level or higher; not seminar or research credit) completed with a grade of 'B' or higher. The allowable courses are: CHEM 4113, CHEM 4311, CHEM 4341, CHEM 4401, CHEM 4452, CHEM 4485, CHEM 4521, CHEM 4740, CHEM 4759, CHEM 4760, CHEM 4762, CHEM 4765, CHEM Special Topics will be considered on a case by case basis.

To apply for the option, undergraduate Biochemistry students must have at least 30 credit hours earned at Georgia Tech with an undergraduate

GPA of 3.3 or higher, and fewer than 90 credits overall (including transfer credit).

The minimum GPA to graduate with an undergraduate degree in Biochemistry to continue to the MS in Chemistry program is 3.0. The minimum GPA for graduation with the MS in 2.7.

Students will need to consult with an advisor to indicate which courses are sharing with the graduate degree in DegreeWorks.

Bachelor of Science in Chemistry - General

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [9]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra [6]	2
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
CHEM 1211K	Chemical Principles I	4
CHEM 1212K	Chemical Principles II	4
CHEM 2380	Synthesis Laboratory I	2
MATH 2551	Multivariable Calculus	4
BIOS 1107 & 1107L	Biological Principles and Biological Principles Laboratory	4
Major Requirements		
CHEM 2216 & 2216L	Quantitative Chemical Analysis and Quantitative Chemical Analysis Laboratory	4
or CHEM 2204	Quantitative Chemical Analysis	
CHEM 2311	Organic Chemistry I	3
CHEM 2312	Organic Chemistry II	3
or CHEM 2308	Organic and Bioorganic Chemistry	
CHEM 2601	Professional Skills for Chemists and Biochemists	1
CHEM 3111	Inorganic Chemistry	3
CHEM 3216 & 3216L	Analytical Chemistry Lecture and Analytical Chemistry Laboratory	5
or CHEM 32	Analytical Chemistry	
CHEM 3380	Synthesis Laboratory II	3
CHEM 3411	Physical Chemistry I	3
CHEM 3412	Physical Chemistry II	3
CHEM 3481	Physical Chemistry Laboratory I	2
Additional Major Requirements		
Research Experience		2
CHEM 4695	Undergraduate Internship (Undergraduate Internship for Academic Credit)	
CHEM 4699	Undergraduate Research [7]	
CHEM 3511	Survey of Biochemistry	3
or CHEM 451	Biochemistry I	
or CHEM 451	Biochemistry II	
or CHEM 352	Biochemistry I	
or CHEM 352	Biochemistry II	
Upper level Chemistry Electives [1]		6
3000-level Technical Electives [2,4]		6
Free Electives		
Free Electives [4,5,8]		12
Total Credit Hours		**122**

Pass-fail only allowed for Free Electives.

1 CHEM 3700 and all CHEM 4XXX and 6XXX allowed except CHEM 4695 and CHEM 4699

2 Courses must be 3000-level or higher, and from the Colleges of Computing, Engineering, or Sciences and MATH 2552, SLS 3110, or SLS 3120. - Limit 3 credit hours of CHEM 4699.

4 Courses may be applied toward completion of a minor.

5 VIP courses may be used only as free electives or in place of CHEM 4699 with pre-approval of the Associate Chair for Academic Programs or their designate.

6 MATH 1554 or MATH 1564 may be used in place of MATH 1553.

7 A maximum of twelve credit hours of CHEM 4699 taken on a letter-grade basis are permitted for the degree program

8 Up to six hours of CHEM 2699 taken on a letter-grade basis may be used as free electives

9 CS 1371 may be used with approval of the Associate Chair for Academic Programs or their designate

Bachelor of Science in Chemistry - Biochemistry Option

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	

or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [6]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra [4]	2
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
CHEM 1211K	Chemical Principles I	4
CHEM 1212K	Chemical Principles II	4
CHEM 2380	Synthesis Laboratory I	2
MATH 2551	Multivariable Calculus	4
BIOS 1107 & 1107L	Biological Principles and Biological Principles Laboratory	4
Major Requirements		
CHEM 2216 & 2216L	Quantitative Chemical Analysis and Quantitative Chemical Analysis Laboratory	4
or CHEM 2204	Quantitative Chemical Analysis	
CHEM 2311	Organic Chemistry I	3
CHEM 2312	Organic Chemistry II	3
or CHEM 2303	Organic and Bioorganic Chemistry	
CHEM 2601	Professional Skills for Chemists and Biochemists	1
CHEM 3111	Inorganic Chemistry	3
CHEM 3216 & 3216L	Analytical Chemistry Lecture and Analytical Chemistry Laboratory	5
or CHEM 3224	Analytical Chemistry	
CHEM 3380	Synthesis Laboratory II	3
CHEM 3411	Physical Chemistry I	3
CHEM 3412	Physical Chemistry II	3
CHEM 3481	Physical Chemistry Laboratory I	2
Biochemistry Option		
CHEM 4511	Biochemistry I	3
or CHEM 3511	Biochemistry I	
CHEM 4512	Biochemistry II	3
or CHEM 3512	Biochemistry II	
CHEM 4581	Biochemistry Laboratory I	3
CHEM 4601	Chemistry Seminar	2
Biochemistry Lab Elective [1,2]		3
Select one of the following: [2]		3
CHEM 4521	Biophysical Chemistry	
CHEM 4582	Biochemistry Laboratory II	
CHEM 4765	Drug Design, Development, and Delivery	
BIOS 3380	Microbiology	
BIOS 3450	Cell and Molecular Biology	
BIOS 4340	Medical Microbiology	
BIOS 4418	Microbial Physiology	
BIOS 4401	Experimental Design and Statistical Methods in Biological Sciences	
BIOS 4464	Developmental Biology	
BIOS 4570	Immunology	
BIOS 4668	Eukaryotic Molecular Genetics	
Free Electives		
Free Electives [2,3,5]		12
Total Credit Hours		**122**

Pass-fail only allowed for Free Electives.

1 BIOS 3450 & BIOS 3451 , OR BIOS 3380 & BIOS 3381, OR CHEM 4582. If four credit hours are totaled, extra counts toward Free Electives.
2 Courses may be applied toward completion of a minor.
3 VIP courses may be used only as free electives or in place of CHEM 4699 with pre-approval of the Associate Chair for Academic Programs or their designate
4 MATH 1554 or MATH 1564 may be used in place of MATH 1553.
5 A maximum of twelve credit hours of CHEM 4699 taken on a letter-grade basis are permitted for the degree program. Up to six hours of CHEM 2699 taken on a letter-grade basis may be used as free electives.
6 CS 1371 may be used with approval of the Associate Chair for Academic Programs or their designate.

Bachelor of Science in Chemistry - Business Option

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [8]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4

MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra [5]	2
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
ECON 2106	Principles of Microeconomics	3
Any SS		6
Core F - Courses Related to Major		
CHEM 1211K	Chemical Principles I	4
CHEM 1212K	Chemical Principles II	4
CHEM 2380	Synthesis Laboratory I	2
MATH 2551	Multivariable Calculus	4
BIOS 1107 & 1107L	Biological Principles and Biological Principles Laboratory	4
Major Requirements		
CHEM 2216 & 2216L	Quantitative Chemical Analysis and Quantitative Chemical Analysis Laboratory	4
or CHEM 22	Quantitative Chemical Analysis	
CHEM 2311	Organic Chemistry I	3
CHEM 2312	Organic Chemistry II	3
or CHEM 23	Organic and Bioorganic Chemistry	
CHEM 2601	Professional Skills for Chemists and Biochemists	1
CHEM 3111	Inorganic Chemistry	3
CHEM 3216 & 3216L	Analytical Chemistry Lecture and Analytical Chemistry Laboratory	5
or CHEM 32	Analytical Chemistry	
CHEM 3380	Synthesis Laboratory II	3
CHEM 3411	Physical Chemistry I	3
CHEM 3412	Physical Chemistry II	3
CHEM 3481	Physical Chemistry Laboratory I	2
Additional Major Required		
Research Experience		2
CHEM 4695	Undergraduate Internship (Undergraduate Internship for Academic Credit)	
CHEM 4699	Undergraduate Research [6]	
CHEM 3511	Survey of Biochemistry	3
or CHEM 45	Biochemistry I	
or CHEM 45	Biochemistry II	
or CHEM 35	Biochemistry I	
or CHEM 35	Biochemistry II	
Upper level Chemistry Electives [1]		3
Business Option		
ACCT 2101	Accounting I: Financial Accounting	3
or MGT 3000	Financial and Managerial Accounting	
MGT 3101	Organizational Behavior	3
or MGT 315	Principles of Management	
or PSYC 22	Industrial/Organizational Psychology	
Select two of the following:		6
MGT 3062	Financial Management	
MGT 3078	Finance and Investments	
MGT 3300	Marketing Management I	
MGT 3660	International Business	
MGT 4015	Advanced Managerial Accounting	
MGT 4026	Financial Reporting and Analysis I	
MGT 4028	Financial Analysis and Reporting of Technology Firms	
MGT 4030	International Accounting	
MGT 4190	Strategic Quality Management and Competitiveness	
MGT 4191	The Entrepreneurship Forum	
MGT 4192	Impact Speaker Series Forum	
MGT 4193	Servant Leadership, Values & Systems	
MGT 4194	Social Enterprise and Entrepreneurship	
MGT 4303	Personal Selling and Sales Management	
MGT 4304	Strategic Brand Management	
MGT 4307	Strategic Marketing	
MGT 4335	International Marketing	
MGT 4610	Law, Management, and Economics	
MGT 4670	Entrepreneurship	
Free Electives		
Free Electives [3,4,7]		9
Total Credit Hours		**122**

Pass-fail only allowed for Free Electives.

1 CHEM 3700 and all CHEM 4XXX and 6XXX allowed except CHEM 4695 and CHEM 4699.
3 Courses may be applied toward completion of a minor.
4 VIP courses may be used only as free electives.
5 MATH 1554 or MATH 1564 may be used in place of MATH 1553.
6 A maximum of twelve credit hours of CHEM 4699 taken on a letter-grade basis are permitted for the degree program
7 Up to six hours of CHEM 2699 taken on a letter-grade basis may be used as free electives
8 CS 1371 may be used with approval of the Associate Chair for Academic Programs or their designate

Bachelor of Science in Chemistry - Polymers and Materials Option

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		

CS 1301	Introduction to Computing [7]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra [4]	2
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
CHEM 1211K	Chemical Principles I	4
CHEM 1212K	Chemical Principles II	4
CHEM 2380	Synthesis Laboratory I	2
MATH 2551	Multivariable Calculus	4
BIOS 1107 & 1107L	Biological Principles and Biological Principles Laboratory	4
Major Requirements		
CHEM 2601	Professional Skills for Chemists and Biochemists	1
CHEM 2216 & 2216L	Quantitative Chemical Analysis and Quantitative Chemical Analysis Laboratory	4
or CHEM 22	Quantitative Chemical Analysis	
CHEM 2311	Organic Chemistry I	3
CHEM 2312	Organic Chemistry II	3
or CHEM 23	Organic and Bioorganic Chemistry	
CHEM 3111	Inorganic Chemistry	3
CHEM 3216 & 3216L	Analytical Chemistry Lecture and Analytical Chemistry Laboratory	5
or CHEM 32	Analytical Chemistry	
CHEM 3380	Synthesis Laboratory II	3
CHEM 3411	Physical Chemistry I	3
CHEM 3412	Physical Chemistry II	3
CHEM 3481	Physical Chemistry Laboratory I	2
Additional Major Requirements		
Research Experience		2
CHEM 4695	Undergraduate Internship (Undergraduate Internship for Academic Credit)	
CHEM 4699	Undergraduate Research [5]	
CHEM 3511	Survey of Biochemistry	3
or CHEM 451	Biochemistry I	
or CHEM 452	Biochemistry II	
or CHEM 3521	Biochemistry I	
or CHEM 3522	Biochemistry II	
Polymers and Materials Courses		**12-13**
MSE 2001	Principles and Applications of Engineering Materials	
CHEM/ MSE 4775	Polymer Science and Engineering I: Formation and Properties	
Select Polymers Interest or Inorganic Materials Interest:		
Polymers interest (select 6 credits):		
MSE 4025	Fiber Product Manufacturing	
MSE 4335	Soft Nano and Bio Materials	
MSE 4751	Introduction to Biomaterials	
MSE 4793	Composite Materials and Processing	
CHEM/ MSE 6750	Preparation and Reaction of Polymers	
CHEM/ MSE 6751	Physical Chemistry of Polymer Solutions	
CHEM/ MSE 6752	Polymer Characterization	
CHEM/ MSE 6757	Advanced Polymer Chemistry	
Materials interest:		
MSE 2021	Materials Characterization	
Materials Interest select one additional course:		
MSE 3015	Electrical, Optical, and Magnetic Properties	
MSE 4010	Environmental Degradation	
MSE 4325	Thin Film Materials Science	
MSE 4330	Fundamentals of Nanomaterials and Nanostructures	
CHEM/ MSE/ CHBE/ME 4759	Electrochemical Energy Storage and Conversion	
Free Electives		
Free Electives [2,3,6]		11-12
Total Credit Hours		**122**

Pass-fail only allowed for Free Electives.

[2] Courses may be applied toward completion of a minor.

[3] VIP courses may be used only as free electives or in place of CHEM 4699 with pre-approval of the Associate Chair for Academic Programs or their designate

[4] MATH 1554 or MATH 1564 may be used in place of MATH 1553.

[5] A maximum of twelve credit hours of CHEM 4699 taken on a letter-grade basis are permitted for the degree program

[6] Up to six hours of CHEM 2699 taken on a letter-grade basis may be used as free electives

[7] CS 1371 may be used with approval of the Associate Chair for Academic Programs or their designate

Bachelor of Science in Chemistry - Pre-Health Option

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	

or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [11]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra [8]	2
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS [3]		9
Core F - Courses Related to Major		
CHEM 1211K	Chemical Principles I	4
CHEM 1212K	Chemical Principles II	4
CHEM 2380	Synthesis Laboratory I	2
BIOS 1107 & 1107L	Biological Principles and Biological Principles Laboratory	4
BIOS 1108 & 1108L	Organismal Biology and Organismal Biology Laboratory	4
Major Requirements		
CHEM 2216 & 2216L	Quantitative Chemical Analysis and Quantitative Chemical Analysis Laboratory	4
or CHEM 2204	Quantitative Chemical Analysis	
CHEM 2311	Organic Chemistry I	3
CHEM 2312	Organic Chemistry II	3
or CHEM 2302	Organic Chemistry II	
CHEM 2601	Professional Skills for Chemists and Biochemists	1
CHEM 3111	Inorganic Chemistry	3
CHEM 3216 & 3216L	Analytical Chemistry Lecture and Analytical Chemistry Laboratory	5
or CHEM 324	Analytical Chemistry	
CHEM 3411	Physical Chemistry I	3
CHEM 3412	Physical Chemistry II	3
CHEM 3511	Survey of Biochemistry	3
or CHEM 4511	Biochemistry I	
or CHEM 3521	Biochemistry I	
Pre-Health Option		
Lab Electives: [1]		6
CHEM 3380	Synthesis Laboratory II	
CHEM 3481	Physical Chemistry Laboratory I	
CHEM 4699	Undergraduate Research [9]	
or CHEM 4699	Intern Assistantship (Undergraduate Internship for Pay)	
or CHEM 4699	Undergraduate Internship (Undergraduate Internship for Academic Credit)	
or CHEM 4699	Undergraduate Research Assistantship	
Technical electives [2,5,9]		3
Pre-Health Electives: [5]		12
BIOS 2600	Genetics	
BIOS 2601	Genetics Laboratory	
BIOS 2610 & BIOS 2611	Integrative Genetics and Integrative Genetics Lab	
BIOS 3000	Survey of Medicine	
BIOS 3380	Microbiology	
BIOS 3381	Microbiology Lab	
BIOS 3450	Cell and Molecular Biology	
BIOS 3451	Cell and Molecular Biology Lab	
BIOS 3753	Human Anatomy	
BIOS 3754	Laboratory in Human Anatomy	
BIOS 3755	Human Physiology	
BIOS 3756	Physiology Laboratory	
BIOS 4012	Protein Biology	
BIOS 4015	Cancer Biology and Biotechnology	
BIOS 4150/ BIOL 6150	Genomics and Applied Bioinformatics	
BIOS 4200	Kinesiological Basis of Human Movement	
BIOS 4238/ APPH 6238	Ion Channels	
BIOS 4340	Medical Microbiology	
BIOS 4400	Human Neuroanatomy	
BIOS 4401	Experimental Design and Statistical Methods in Biological Sciences	
BIOS 4440	Human Pathology	
BIOS 4464	Developmental Biology	
BIOS 4471	Behavioral Biology	
BIOS 4500	Drug Discovery	
BIOS 4510/ BIOL 8510	Epigenetics, Stem Cells, and Development	
BIOS 4520	Health Genes Society	
BIOS 4530/ BIOL 8530	Human Evolutionary Genomics	
BIOS 4560/ BIOL 8560	RNA Biology and Biotechnology	
BIOS 4545	Genetics of Complex Human Traits and Diseases	
BIOS 4570	Immunology	
BIOS 4607/ BIOL 6607	Molecular Biology of Microbes: Disease, Nature, and Biotechnology	
BIOS 4651	Bioethics	
BMED 3100	Systems Physiology	

	BMED 3600 Physiology of Cellular and Molecular Systems	
	CHEM 4521 Biophysical Chemistry	
	CHEM 4765 Drug Design, Development, and Delivery	
Free Electives		
Free Electives [1,4,5,6,7,9,10]		10
Total Credit Hours		**122**

1 Lab Electives:
Select two of three lab courses. The lab elective may be fulfilled with either CHEM 3380 (3 credits) or CHEM 3481 (2 credits) or one of the following [CHEM 4695 (3 credits) or CHEM 4699 (3 credits) or CHEM 4694 (no credit) or CHEM 4698 (no credit)].
Research or Internship Experience:
Either Undergraduate Research CHEM 4699 (3) or Undergraduate Internship CHEM 4695 (3) are acceptable. If research or an internship is conducted for pay / audit rather than credit (e.g., CHEM 4698 or CHEM 4694) , then additional free elective(s) may be substituted to achieve the required earned hours to graduate. The research or internship experience must include a final comprehensive laboratory report. Only one Research or Internship course may be used for the Lab elective requirement. If CHEM 3481 is used, add one free elective.

2 The technical elective requirement may be fulfilled by coursework in Science, Engineering, and Computing at the 3000 level or higher. MATH 2551, MATH 2552, SLS 3110, or SLS 3120 may also be used for a Technical Elective. If a 4 credit hour course is used, one less free elective credit is required

3 It is suggested students select pre-health preparation courses (SOC or PSYC).

4 It is suggested students select pre-health preparation courses (BIOS, HTS, LMC, PSYC).

5 Courses may be applied toward completion of a minor.

6 VIP courses may be used only as free electives or in place of CHEM 4699 with pre-approval from the Associate Chair for Academic Programs or their designate

7 Courses taken as pass-fail may only be used in free electives.

8 MATH 1554 or MATH 1564 may be used in place of MATH 1553.

9 A maximum of twelve credit hours of CHEM 4699 taken on a letter-grade basis are permitted for the degree program

10 Up to six hours of CHEM 2699 taken on a letter-grade basis may be used as free electives

11 CS 1371 may be used with approval of the Associate Chair for Academic Programs or their designate

BACHELOR OF SCIENCE IN CIVIL ENGINEERING

The four-year curriculum leading to the Bachelor of Science in Civil Engineering (BS CE) enables the graduate to enter professional practice as an engineer or to continue their studies in programs leading to advanced degrees in the following broad fields of specialization:

- Construction Engineering,
- Environmental and Water Systems,
- Geotechnical Systems,
- Structural Systems,
- Transportation Systems.

The BS CE degree program is designed to offer depth in course material considered essential for all civil engineers, as well as flexibility in selecting elective courses that offer breadth of topic exposure. Civil engineers contribute to society in numerous ways; thus, the School's philosophy is to provide the student with a range of electives that meet student interests. Civil engineers must not only be technically proficient, but also must be effective in working with people and with professionals in other disciplines.

Prerequisites and Other Requirements

Students must satisfy all prerequisites for a particular course. In addition to campus-wide academic requirements for graduation with a bachelor's degree, the following are also required for the BSCE degree:

A **C** or better must have been earned in the following:

Code	Title	Credit Hours
MATH 1551	Differential Calculus	2
MATH 1552	Integral Calculus	4
MATH 1553	Introduction to Linear Algebra	2
MATH 2552	Differential Equations	4
PHYS 2211	Introductory Physics I	4
CHEM 1310	Principles of General Chemistry for Engineers	4
COE 2001	Statics	2

The number of quality points earned in CEE courses taken toward the degree must be at least twice the number of credit hours in those courses. If a course is repeated, the latest grade will be included in applying this rule. No CEE course may be repeated for the purpose of satisfying this rule if the original grade was a **C** or higher.

Program Educational Objectives

Graduates will pursue a diverse range of careers that build on their engineering education. During the initial years of their careers, graduates will:

1. be successfully employed in civil- and environmental-related fields, or other career paths, with prominent companies and organizations in industry, government, non-governmental organizations, and entrepreneurial ventures;
2. pursue graduate education and research in civil and environmental engineering, and other fields;
3. be global collaborators, participating in interdisciplinary and culturally diverse teams, and advancing in leadership positions in the profession;
4. continue professional development by obtaining professional licensure or certifications, continuing education credits, or post-graduate study;
5. be active in service to the profession and to the State of Georgia, the nation, and the world.

The School of Civil and Environmental Engineering has established an optional concentration area for the Bachelor of Science Civil Engineering degree in the area of Construction and Infrastructure Systems Engineering.

Bachelor of Science in Civil Engineering - Standard Option

Bachelor of Science in Civil Engineering - Construction and Infrastructure Systems Engineering

Cooperative Plan

Since 1912, Georgia Tech has offered a five-year Undergraduate Cooperative Program to those students who wish to combine career-related experience with classroom studies. The program is the fourth oldest of its kind in the world and the largest optional co-op program in the country.

Students alternate between work assignments and classroom studies until they complete four or five semesters of work. Co-op students with a civil engineering major complete the same coursework on campus that is completed by regular four-year students. Most co-op students begin the program as freshmen or sophomores and are classified as full-time students regardless of whether they are attending classes on campus or are full time at an employer's location.

Students who participate in the program have the opportunity to develop career interests, become more confident in their career choices, and develop human relations skills through their work experience. Graduates of the program receive a bachelor's degree with a Cooperative Plan Designation.

The Georgia Tech Internship Program is for civil engineering students who do not participate in the Cooperative Program, but want some career-related experience before graduation. Students generally work for one semester, usually in the summer, with an option for more work experiences. Students must have completed at least 30 hours of coursework at Georgia Tech before they can participate in the program. For more details, visit www.gtip.gatech.edu/.

In addition, there is the Work Abroad Program (www.workabroad.gatech.edu), which complements a student's formal education with paid international work experience directly related to civil engineering. Participating students typically are juniors and seniors. The international work assignments are designed to include practical training, cross-cultural exposure and learning, and the acquisition of needed skills. This program satisfies requirements for the International Plan, which is available to civil engineering students.

For more information about all of the programs in the Center for Career Discovery and Development, visit www.careerdiscovery.gatech.edu.

International Plan

The International Plan is a challenging and coherent academic program for undergraduates that develops global competence within the context of a student's major. It is a degree-long program that integrates international studies and experiences into any participating major at Georgia Tech. It helps to prepare Georgia Tech graduates professionally and personally for successful lives in the twenty-first century.

The International Plan is not intended to replace current international programs; it supplements them. Existing study abroad opportunities continue to be offered. It is also not intended to be an add-on to the current degree programs. It is intended to be another curriculum path to earn a degree in which international competence is integrated into the program of study. The plan can be completed within the normal timeframe of four years of undergraduate study.

The overarching model for the International Plan has four components:

1. International coursework: Three courses to include one from each of the following categories:
   a. International relations
   b. Global economics
   c. A course about a specific country or region
2. International experience: Two terms abroad (not less than 26 weeks) engaged in any combination of study abroad, research, or internship
3. Second language proficiency: All students in the program are expected to reach at least the proficiency level equivalent to two years of college-level language study. Students who use the language to study, conduct research, or participate in an internship during their international experience are expected to attain a higher level of proficiency. Language proficiency is determined by testing (not course credits).
4. Culminating course: A capstone course in the major designed to tie the international studies and experiences together with the student's major

Completion of the International Plan is recognized by a designation on the student's diploma indicating completion of the degree with global competence.

For additional information about the International Plan visit www.oie.gatech.edu/internationalplan.

Research Option

The Research Option is intended for students who seek a concentrated research experience, culminating in an undergraduate thesis, integrated into their undergraduate studies in civil engineering. In order to graduate with a BSC.E – Research Option degree, the students must:

Complete at least nine units of undergraduate research (over at least two, preferably three terms). Research may be for either pay (CEE 2698 or CEE 4698) or credit (CEE 2699 or CEE 4699). Research for credit may be used towards the BS CE approved elective requirements.

Write an undergraduate thesis/report of research on their findings. This is usually done during the graduating term. The thesis will be published in the Georgia Tech Library.

Take two 1-hour classes: LMC 4701 (typically taken during the first or second semester of research) and LMC 4702 (taken during the thesis-writing semester).

At least six of the nine required credit hours of research should be on the same topic. A research proposal must be approved by a faculty advisor and one other faculty member. This proposal will be completed in LMC 4701 which serves as a prerequisite for LMC 4702. Completion of Research Option is noted on the student's transcript.

BS/MS Option - Civil Engineering

The BS/MS Option is designed to attract the best-of-the-best undergraduate students and is especially intended for students who demonstrate an interest in, and ability for, additional education beyond the bachelor's degree.

Students will be eligible to apply for the program after completion of 30 semester credit hours at Georgia Tech and appropriate progress in their degree program. As a practical matter, students should apply for the program at least three semesters prior to graduation in order to take graduate-level courses prior to receiving their BS degree. Students must have a Georgia Tech GPA of 3.5 or higher for admission into the BS/MS Program in Civil Engineering.

This program is available only to those completing a Bachelor's degree with the School of Civil and Environmental Engineering

Students in the BS/MS Option remain undergraduates until they meet the requirements for the bachelor's degree, at which point they will receive the BSCE or BSEnvE degree. Their status will then be changed to graduate status. Graduate school application fees and the GRE requirements are waived.

Once admitted, a GPA of at least 3.0 must be maintained to remain in the program. Additionally, students in the BS/MS program are eligible to use the Graduate Course Option even if their cumulative grade-point average is below 3.5 at the time they complete their bachelor's degree.

Bachelor of Science in Civil Engineering (Standard)

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [3]	4
Core B - Institutional Options		
CS 1371	Computing for Engineers	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2,3]	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus [3]	2
MATH 1553	Introduction to Linear Algebra [3]	2
or MATH 155	Linear Algebra	
or MATH 156	Linear Algebra with Abstract Vector Spaces	

Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
COE 2001	Statics [3]	2
MATH 2551	Multivariable Calculus	4
MATH 2552	Differential Equations [3]	4
CHEM 1310	Principles of General Chemistry for Engineers [3]	4
Select one of the following:		4
BIOS 1107 & 1107L	Biological Principles and Biological Principles Laboratory	
BIOS 1108 & 1108L	Organismal Biology and Organismal Biology Laboratory	
EAS 2600	Earth Processes	
Ethics Requirement (Civil Engineering approved) [1]		
Major Requirements		
CEE 1770	Introduction to Engineering Graphics and Visualization	3
CEE 2040	Dynamics	2
CEE 2300	Environmental Engineering Principles	3
CEE 3000	Civil Engineering Systems	3
CEE 3020	Civil Engineering Materials	3
CEE 3040	Fluid Mechanics	3
Select one of the following:		3
CEE 3770	Statistics and Applications	
ISYE 3770	Statistics and Applications	
MATH 3670	Probability and Statistics with Applications	
CEE 4090	Capstone Design	3
College of Engineering Requirements		
COE 3001	Mechanics of Deformable Bodies	3
Select one of the following:		3
CHBE 2130	Chemical Engineering Thermodynamics I	
ME 3322	Thermodynamics	
MSE 3001	Chemical Thermodynamics of Materials	
CE Breadth Electives		
Select three of the following:		9
CEE 3051	Introduction to Structural Engineering	
CEE 4100	Construction Engineering and Management	
CEE 4200	Hydraulic Engineering	
CEE 4300	Environmental Engineering Systems	
CEE 3400	Introduction to Geotechnical Engineering	
CEE 4600	Transportation Planning, Operations, and Design	
CEE 4200	Hydraulic Engineering	3
or CEE 3400	Introduction to Geotechnical Engineering	
CE Technical Electives		
CE Electives [4]		18
Approved Electives		
Approved Electives [5]		6
Total Credit Hours		**128**

No pass-fail allowed, except for CS 1171.

CEE 4801 not allowed toward degree.

Students must earn a 2.0 average in all CEE courses.

1. Students must complete one Ethics course during their program. For a complete list of Ethics courses, please see: Ethics
2. If PHYS 2231 is taken, extra credit hour goes to Free Electives.
3. Minimum grade of C is required.
4. Any 3000-level or higher CEE course, with the exception of CEE 4801, CEE 8811, and CEE 8812. Maximum of 3 credit hours CEE 4699 and CEE 4900. Only one non-CEE course allowed: COA 4010, CP 4010, CP 4020, CP 4310, and CP 4510.
5. Maximum 3 credit hours CEE 2699 allowed. MATH 1113, PHYS 2802, PHYS 2XXX (AP credit), one-hour MUSI courses, GT 1000, and FREE XXXX are not allowed.

Bachelor of Science in Civil Engineering - Construction and Infrastructure Systems Engineering

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [3]	4
Core B - Institutional Options		
CS 1371	Computing for Engineers	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2,3]	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus [3]	2
MATH 1553	Introduction to Linear Algebra [3]	2
or MATH 1554	Linear Algebra	
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3

HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
COE 2001	Statics [3]	2
MATH 2551	Multivariable Calculus	4
MATH 2552	Differential Equations [3]	4
CHEM 1310	Principles of General Chemistry for Engineers [3]	4
Select one of the following:		4
BIOS 1107 & 1107L	Biological Principles and Biological Principles Laboratory	
BIOS 1108 & 1108L	Organismal Biology and Organismal Biology Laboratory	
EAS 2600	Earth Processes	
Ethics Requirement (Civil Engineering approved) [1]		
Major Requirements		
CEE 1770	Introduction to Engineering Graphics and Visualization	3
CEE 2040	Dynamics	2
CEE 2300	Environmental Engineering Principles	3
CEE 3000	Civil Engineering Systems	3
CEE 3020	Civil Engineering Materials	3
CEE 3040	Fluid Mechanics	3
Select one of the following:		3
CEE 3770	Statistics and Applications	
ISYE 3770	Statistics and Applications	
MATH 3670	Probability and Statistics with Applications	
CEE 4090	Capstone Design	3
College of Engineering Requirements		
COE 3001	Mechanics of Deformable Bodies	3
Select one of the following:		3
CHBE 2130	Chemical Engineering Thermodynamics I	
ME 3322	Thermodynamics	
MSE 3001	Chemical Thermodynamics of Materials	
Construction and Infrastructure Systems Engineering Concentration		
CEE 4100	Construction Engineering and Management	3
Concentration electives		9
CEE 4050	Infrastructure System Management	
CEE 4110	Construction Planning, Estimating, and Scheduling	
CEE 4120	Construction Operations	
CEE 4130	Construction Safety and Health	
CEE 4140	Bldg Info Model Constr	
CEE 4150	Construction Management & Megaprojects	
CEE 4160	Smart and Sustainable Cities	
CEE 4170	Construction Law	
CEE 4803	Special Topics (Entrepreneurship in CEE)	
CEE 6651	Infrastructure Systems Management	
CEE 6652	Infrastructure Management: IT Applications	
CEE 8813	Special Topics (Data Analytics for CEE Systems)	
CEE 8813	Special Topics (Sustainable Buildings)	
CE Breadth Electives		
Select two of the following:		6
CEE 3051	Introduction to Structural Engineering	
CEE 4200	Hydraulic Engineering	
CEE 4300	Environmental Engineering Systems	
CEE 3400	Introduction to Geotechnical Engineering	
CEE 4600	Transportation Planning, Operations, and Design	
CEE 4200	Hydraulic Engineering	3
or CEE 3400	Introduction to Geotechnical Engineering	
CE Technical Electives		
CE Electives [4]		9
Approved Electives		
Approved Electives [5]		6
Total Credit Hours		**128**

No pass-fail allowed, except for CS 1171.

CEE 4801 not allowed toward degree.

Students must earn a 2.0 average in all CEE courses.

1. Students must complete one Ethics course during their program. For a complete list of Ethics courses, please see: Ethics
2. If PHYS 2231 is taken, extra credit hour goes to Free Electives.
3. Minimum grade of C is required.
4. Any 3000-level or higher CEE course, with the exception of CEE 4801, CEE 8811, and CEE 8812. Maximum of 3 credit hours CEE 4699 and CEE 4900. Only one non-CEE course allowed: COA 4010, CP 4010, CP 4020, CP 4310, and CP 4510.
5. Maximum 3 credit hours CEE 2699 allowed. MATH 1113, PHYS 2802, PHYS 2XXX (AP credit), one-hour MUSI courses, GT 1000, and FREE XXXX are not allowed.

BACHELOR OF SCIENCE IN COMPUTATIONAL MEDIA

The Bachelor of Science in Computational Media is a collaborative effort by the College of Computing, the School of Literature, Media, and Communication (LMC), and the School of Music. The program offers a thorough education in all aspects of the computer as a medium: the technical, the historical-critical, and the applied. Program graduates will have both significant hands-on and theoretical knowledge of computing and an understanding of visual design and the history of media. Graduates will be uniquely positioned to plan, create, and critique new digital media forms for entertainment, education, and business communication.

The program requires 36 credit hours of courses in computer science and 30 credit hours of courses in Music Technology or LMC (in addition to the humanities requirement). A substantial number of required courses in each unit ensures that every student has basic competence in:

- computational principles;
- the representation and manipulation of digital media, including graphics and sound;
- software design;
- visual and interactive design;
- digital arts; and
- media theory and history.

After completing required courses, students specialize in a specific area of media computing. Typical specialty areas include:

- Interactive games design: This is one of the fastest growing areas of digital media production and is already a $7 billion industry.
- Special effects: As special effects become more complex and focused on computer-generated imagery, employment in this area will increasingly require expertise in both media and computer science.
- Culturally informed program design: As programming work is increasingly outsourced to nations offering lower labor costs, programming that adds value through a sophisticated response to the needs of specific corporate and group cultures will offer job security to American programmers.

Depending on their coursework within the BS program, students will also be qualified to enter graduate studies in computer science, digital arts, digital media studies, and human-computer interface.

- Bachelor of Science in Computational Media - Intelligence - Film & Media Studies
- Bachelor of Science in Computational Media - Intelligence - Games
- Bachelor of Science in Computational Media - Intelligence - Interaction Design
- Bachelor of Science in Computational Media - Media - Film & Media Studies
- Bachelor of Science in Computational Media - Media - Games
- Bachelor of Science in Computational Media - Media - Interaction Design
- Bachelor of Science in Computational Media - Music Technology - Intelligence
- Bachelor of Science in Computational Media - Music Technology - Media
- Bachelor of Science in Computational Media - Music Technology - People
- Bachelor of Science in Computational Media - People - Film & Media Studies
- Bachelor of Science in Computational Media - People - Games
- Bachelor of Science in Computational Media - People - Interaction Design

Cooperative Programs

The College of Computing participates in the undergraduate and graduate Cooperative Programs.

See links below for further Information.

Undergraduate Cooperative Plan

Graduate Cooperative Plan

International Plan

The Computational Media (CM) International Plan follows the Institute model to develop a global competence within the student's major program of study. It thus integrates international studies and experiences with work in all aspects of the computer as a medium, preparing graduates to plan, create, and critique new digital media forms within an international professional environment.

As in the basic CM program, students following the International Plan will take credit 36 hours of courses in CS and 30 credit hours of courses in LMC (in addition to the basic humanities requirement). Students will also:

1. take three international courses, including one from each of the following categories: International Relations, Global Economics, and a course on a specific country or region;
2. spend two terms abroad engaged in any combination of study abroad, research, or internship;
3. demonstrate language proficiency equivalent to two years of college-level language study (to be determined by testing); and
4. complete a CM capstone course that links international studies with the major.

Research Option

The CM Research Plan follows the Institute model to allow students to incorporate research experiences into the major program of study. Students will complete nine hours of credit research work on various aspects of the computer as a medium, working in such areas as computational principles, the representation and manipulation of digital media, software design, visual and interactive design, digital art, and media theory and history.

As in the basic CM program, students following the Research Plan will take 36 credit hours of courses in CS and 30 credit hours of courses in LMC (in addition to the basic humanities requirement). CM students can complete the Research Option with nine CS or LMC research hours. Students cannot have a mix of both count towards the Research Option. The breakdown of hours is as follows:

Code	Title	Credit Hours
Undergradate Research		9
LMC 4701	Undergraduate Research Proposal Writing	1

LMC 4702	Undergraduate Research Thesis Writing	1
Total Credit Hours		**11**

BS/MS Computational Media and Digital Media

Students who want to pursue the five-year BS/MS combination in CM and DM must apply to the school of LMC after completing at least 75 hours of work towards the CM degree. Applicants should have a cumulative GPA of at least 3.5. This GPA must be maintained for the student to take graduate level courses. Students must start the program in the Fall to be on track with other MS students.

Students admitted to the program will take a total of twelve credit hours of graduate course work during their final undergraduate year; six credit hours of that work, in DM courses, will count towards two 4000 level LMC courses (6 hours) and will count for both undergraduate and graduate credit. During the summer term after their fourth year, students will participate in an approved internship program. During their fifth year, students will take a total of 24 credit hours, including either LMC 6800 or LMC 7000, and with no more than three courses taken outside of the DM program.

Bachelor of Science in Computational Media - Intelligence-Film & Media Studies

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		3
Any LMC HUM		3
Core D - Science, Math, & Technology		
Lab Science		8
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [4]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
PSYC 1101	General Psychology	3
Any SS		6
Core F - Courses Related to Major		
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
CS 2340	Objects and Design [1]	3
LMC 2700	Introduction to Computational Media [1]	3
MATH 2550	Introduction to Multivariable Calculus [4]	2
Major Requirement		
CS 2110	Computer Organization and Programming [1]	4
CS 4001	Computing, Society, and Professionalism	3
or CS 4726	Privacy, Technology, Policy, and Law	
or SLS 311(	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,3]		6
Intelligence Requirements		
CS 3510	Design and Analysis of Algorithms [1]	3
CS 3600	Introduction to Artificial Intelligence [1]	3
CS 4510	Automata and Complexity Theory [1]	3
CS 3630	Introduction to Perception and Robotics [1]	3
or CS 3790	Introduction to Cognitive Science	
or PSYC 3045	Sensation and Perception	
Select two of the following: [1]		6
CS 4495	Computer Vision	
CS 4635	Knowledge-Based Artificial Intelligence	
CS 4641	Machine Learning	
CS 4649	Robot Intelli Planning	
CS 4646	Machine Learning for Trading	
CS 4650	Natural Language Understanding	
CS 4731	Game AI	
Film & Media Studies Requirements		
LMC 2400	Introduction to Media Studies [1]	3
LMC 4813	Special Topics (Media/Design Capstone) [1]	3
Film and Media Making course [1]		3
LMC 4720	Interactive Narrative	
Any LMC 27XX course		
Any LMC 37XX course		
Film and Media Studies courses [1]		9
LMC 2400	Introduction to Media Studies	
LMC 2500	Introduction to Film	
LMC 2600	Introduction to Performance Studies	
LMC 3206	Communication and Culture	
LMC 3314	Technologies of Representation	
LMC 3352	Film and/as Technology	
LMC 3402	Graphic and Visual Design	
LMC 3406	Video Production	
LMC 3248	Poetry and Digital Culture	
LMC 3362	Science, Technology and Performance	
Any LMC 325X, 37XX, 38XX course		

CM or Media Courses (LMC 2XXX, 3XXX, 4XXX courses) [1]	9
Total Credit Hours	**122**

Pass-Fail is allowed for courses in core areas C, D, E and Free.

1 Minimum grade of C required.

3 Junior Design Options are as follows (students must pick one option and may not change):

- Option 1 - LMC 3432, LMC 3431, CS 3311,CS 3312.
- Option 2 - ECE VIP courses and LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option.
- Option 4- CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours), LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit. Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.

4 Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computational Media - Intelligence - Games

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
or CS 1315	Introduction to Media Computation	
Core C - Humanities		
Any HUM		3
Any LMC HUM		3
Core D - Science, Math, & Technology		
Lab Science		8
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [4]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
PSYC 1101	General Psychology	3
Any SS		6
Core F - Courses Related to Major		
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
CS 2340	Objects and Design [1]	3
LMC 2700	Introduction to Computational Media [1,2]	3
MATH 2550	Introduction to Multivariable Calculus [4]	2
Major Requirements		
CS 2110	Computer Organization and Programming	4
CS 4001	Computing, Society, and Professionalism	3
or CS 4726	Privacy, Technology, Policy, and Law	
or SLS 311(	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,3]		6
Intelligence Requirements		
CS 3510	Design and Analysis of Algorithms [1]	3
CS 3600	Introduction to Artificial Intelligence [1]	3
Computational Complexity (select one):		3
CS 4510	Automata and Complexity Theory [1]	
CS 3240	Languages and Computation	
Emodied Intelligence (select one): [1]		3
CS 3630	Introduction to Perception and Robotics	
CS 3790	Introduction to Cognitive Science	
PSYC 3040	Sensation and Perception	
Approaches to Intelligence (select two): [1]		6
CS 4495	Computer Vision	
CS 4635	Knowledge-Based Artificial Intelligence	
CS 4641	Machine Learning	
CS 4646	Machine Learning for Trading	
CS 4649	Robot Intelli Planning	
CS 4650	Natural Language Understanding	
CS 4731	Game AI	
Games Requirements		
LMC 2410	Introduction to Game Studies [1]	3
LMC 4710	Game Studio [1]	3
Design course (select one): [1]		3
LMC 2730	Constructing the Moving Image	
LMC 3710	Principles of Interaction Design	
Game Design courses (select three): [1]		9
LMC 4720	Interactive Narrative	
LMC 4725	Games Design as a Cultural Practice	
LMC 4730	Experimental Digital Art	
LMC 4731	Game AI	
CM or Media Courses (select three): [1]		9
LMC 2400	Introduction to Media Studies	

LMC 2500	Introduction to Film	
LMC 3206	Communication and Culture	
LMC 3314	Technologies of Representation	
LMC 3362	Science, Technology and Performance	
LMC 3406	Video Production	
LMC 3402	Graphic and Visual Design	
LMC 3853	Special Topics in Film	
Any LMC 27XX, 37XX, 47XX, 325X		
Total Credit Hours		**122**

[1] Minimum grade of C required.

[3] Junior Design Options are as follows (students must pick one option and may not change):

- Option 1 - LMC 3432LMC 3432, LMC 3431, CS 3311,CS 3312.
- Option 2 - ECE VIP courses and LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option
- Option 4- CS 2701 (3 hours), CS 4699CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699CS 4699- I2P (6 hours), LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit.

Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.

[4] Two credits of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computational Media - Intelligence-Interaction Design

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		3
Any LMC HUM		3
Core D - Science, Math, & Technology		
Lab Science		8
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [4]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
PSYC 1101	General Psychology	3
Any SS		6
Core F - Courses Related to Major		
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
CS 2340	Objects and Design [1]	3
LMC 2700	Introduction to Computational Media [1]	3
MATH 2550	Introduction to Multivariable Calculus [4]	2
Major Requirement		
CS 2110	Computer Organization and Programming [1]	4
CS 4001	Computing, Society, and Professionalism	3
or CS 4726	Privacy, Technology, Policy, and Law	
or SLS 311(	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,3]		6
Intelligence Requirements		
CS 3510	Design and Analysis of Algorithms [1]	3
CS 3600	Introduction to Artificial Intelligence [1]	3
CS 4510	Automata and Complexity Theory [1]	3
Embodied Intelligence (select one): [1]		3
CS 3630	Introduction to Perception and Robotics	
CS 3790	Introduction to Cognitive Science	
PSYC 3040	Sensation and Perception	
Approaches to Intelligence (select two): [1]		6
CS 4495	Computer Vision	
CS 4635	Knowledge-Based Artificial Intelligence	
CS 4641	Machine Learning	
CS 4646	Machine Learning for Trading	
CS 4649	Robot Intelli Planning	
CS 4650	Natural Language Understanding	
CS 4731	Game AI	
Interaction Design Requirements		
LMC 3710	Principles of Interaction Design [1]	3
LMC 4813	Special Topics (Media/Design Capstone) [1]	3
Design course: [1]		3
LMC 2720	Principles of Visual Design	
LMC 3705	Principles of Information Design	
LMC 4730	Experimental Digital Art	
Design and Culture courses: [1]		9

LMC 2730	Constructing the Moving Image	
LMC 3206	Communication and Culture	
LMC 3314	Technologies of Representation	
LMC 3705	Principles of Information Design	
LMC 4730	Experimental Digital Art	
CM or Media courses [1]		9
LMC 2400	Introduction to Media Studies	
LMC 2500	Introduction to Film	
LMC 3206	Communication and Culture	
LMC 3314	Technologies of Representation	
LMC 3362	Science, Technology and Performance	
LMC 3406	Video Production	
LMC 3402	Graphic and Visual Design	
LMC 3853	Special Topics in Film	
Any LMC 27XX, 37XX, 47XX, 325X		
Total Credit Hours		**122**

Pass Fail is allowed for courses in core areas C, D, E and Free.

1 Minimum grade of C required.

3 Junior Design Options are as follows (students must pick one option and may not change):

- Option 1 - LMC 3432, LMC 3431, CS 3311CS 3311,CS 3312CS 3312.
- Option 2 - ECE VIP courses and LMC 3403LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option
- Option 4- CS 2701CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699CS 4699- I2P (6 hours), LMC 3403LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit. Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.

4 Two credits of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computational Media - Media-Film & Media Studies

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		3
Any LMC HUM		3
Core D - Science, Math, & Technology		
Lab Science		8
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [4]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
CS 2340	Objects and Design [1]	3
LMC 2700	Introduction to Computational Media [1]	3
MATH 2550	Introduction to Multivariable Calculus [4]	2
Major Requirement		
CS 2261	Media Device Architectures	4
CS 4001	Computing, Society, and Professionalism	3
or CS 4726	Privacy, Technology, Policy, and Law	
or SLS 3110	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,3]		6
Media Requirements		
CS 3451	Computer Graphics [1]	3
Media Technology (select two): [1]		6
CS 4455	Video Game Design and Programming	
CS 4460	Introduction to Information Visualization	
CS 4464	Computational Journalism	
CS 4475	Computational Photography	
CS 4480	Digital Video Special Effects	
CS 4496	Computer Animation	
CS 4590	Principles and Applications of Computer Audio	
Film & Media Studies Requirements		
LMC 2400	Introduction to Media Studies	3
LMC 4813	Special Topics (Media/Design Capstone)	3
Film & Media Making (select one): [1]		3
LMC 4720	Interactive Narrative	
Any LMC 27XX, 37XX		
Film & Media Studies (select three): [1]		9
LMC 2400	Introduction to Media Studies	
LMC 2500	Introduction to Film	

LMC 2600	Introduction to Performance Studies	
LMC 3206	Communication and Culture	
LMC 3248	Poetry and Digital Culture	
LMC 3314	Technologies of Representation	
LMC 3352	Film and/as Technology	
LMC 3362	Science, Technology and Performance	
LMC 3402	Graphic and Visual Design	
LMC 3406	Video Production	
Any LMC 325X course		
Any LMC 38XX course		
CM or LMC Courses [1]		9
Any LMC 2XXX, 3XXX, 4XXX		
Free Electives		
Free Electives		9
Total Credit Hours		**122**

Pass Fail is allowed for courses in core areas C, D, E and Free.

1 Minimum grade of C required.

3 Junior Design Options are as follows (students must pick one option and may not change):

- Option 1 - LMC 3432, LMC 3431, CS 3311CS 3311,CS 3312CS 3312.
- Option 2 - ECE VIP courses and LMC 3403LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option
- Option 4- CS 2701CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours), LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit. Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.

4 Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computational Media - Media-Games

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		3
Any LMC HUM		3
Core D - Science, Math, & Technology		
Lab Science		8
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [4]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
CS 2340	Objects and Design [1]	3
LMC 2700	Introduction to Computational Media [1]	3
MATH 2550	Introduction to Multivariable Calculus [4]	2
Major Requirement		
CS 2261	Media Device Architectures [1]	4
CS 4001	Computing, Society, and Professionalism	3
or CS 4726	Privacy, Technology, Policy, and Law	
or SLS 3110	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,3]		6
Media Requirements		
CS 3451	Computer Graphics [1]	3
Media Technology (select two): [1]		6
CS 4455	Video Game Design and Programming	
CS 4460	Introduction to Information Visualization	
CS 4464	Computational Journalism	
CS 4475	Computational Photography	
CS 4480	Digital Video Special Effects	
CS 4496	Computer Animation	
CS 4590	Principles and Applications of Computer Audio	
Games Requirements		
LMC 2410	Introduction to Game Studies [1]	3
LMC 4710	Game Studio [1]	3
CS 3600	Introduction to Artificial Intelligence [1]	3
Design course: [1]		3
LMC 2730	Constructing the Moving Image	
LMC 3710	Principles of Interaction Design	
Game Design courses: [1]		9
LMC 4720	Interactive Narrative	
LMC 4725	Games Design as a Cultural Practice	
LMC 4730	Experimental Digital Art	

LMC 4731	Game AI	
CM or Media Courses [1]		9
LMC 2400	Introduction to Media Studies	
LMC 2500	Introduction to Film	
LMC 3206	Communication and Culture	
LMC 3314	Technologies of Representation	
LMC 3362	Science, Technology and Performance	
LMC 3406	Video Production	
LMC 3402	Graphic and Visual Design	
LMC 3853	Special Topics in Film	
Any LMC 27XX, 37XX, 47XX, 325X		
Free Electives		
Free Electives		6
Total Credit Hours		**122**

Pass Fail is allowed for courses in core areas C, D, E and Free.

1 Minimum grade of C required.

3 Junior Design Options are as follows (students must pick one option and may not change):

- Option 1 - LMC 3432, LMC 3431, CS 3311CS 3311,CS 3312CS 3312.
- Option 2 - ECE VIP courses and LMC 3403LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option
- Option 4- CS 2701CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403LMC 3403 (3 hours) = 9 hours OR CS 4699CS 4699- I2P (6 hours), LMC 3403LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit. Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.

4 Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computational Media - Media-Interaction Design

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		3
Any LMC HUM		3
Core D - Science, Math, & Technology		
Lab Science		8
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [4]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
CS 2340	Objects and Design [1]	3
LMC 2700	Introduction to Computational Media [1]	3
MATH 2550	Introduction to Multivariable Calculus [4]	2
Major Requirement		
CS 2261	Media Device Architectures	4
CS 4001	Computing, Society, and Professionalism	3
or CS 4726	Privacy, Technology, Policy, and Law	
or SLS 3110	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,3]		6
Media Requirements		
CS 3451	Computer Graphics	3
Media Technology (select two): [1]		6
CS 4455	Video Game Design and Programming	
CS 4460	Introduction to Information Visualization	
CS 4464	Computational Journalism	
CS 4475	Computational Photography	
CS 4480	Digital Video Special Effects	
CS 4496	Computer Animation	
CS 4590	Principles and Applications of Computer Audio	
Interaction Design Requirements		
LMC 3710	Principles of Interaction Design [1]	3
LMC 4813	Special Topics (Media/Design Capstone) [1]	3
Design course: [1]		3
LMC 2720	Principles of Visual Design	
LMC 3705	Principles of Information Design	
LMC 4730	Experimental Digital Art	
Design and Culture courses: [1]		9
LMC 2730	Constructing the Moving Image	
LMC 3206	Communication and Culture	
LMC 3314	Technologies of Representation	

LMC 3705	Principles of Information Design	
LMC 4730	Experimental Digital Art	
CM or Media Courses [1]		9
LMC 2400	Introduction to Media Studies	
LMC 2500	Introduction to Film	
LMC 3206	Communication and Culture	
LMC 3314	Technologies of Representation	
LMC 3362	Science, Technology and Performance	
LMC 3406	Video Production	
LMC 3402	Graphic and Visual Design	
LMC 3853	Special Topics in Film	
Any LMC 27XX, 37XX, 47XX, 325X		
Free Electives		
Free Electives		9
Total Credit Hours		**122**

Pass Fail is allowed for courses in core areas C, D, E and Free.

[1] Minimum grade of C required.

[3] Junior Design Options are as follows (students must pick one option and may not change):

- Option 1 - LMC 3432, LMC 3431, CS 3311CS 3311,CS 3312CS 3312.
- Option 2 - ECE VIP courses and LMC 3403LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option
- Option 4- CS 2701CS 2701 (3 hours), CS 4699CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699CS 4699- I2P (6 hours), LMC 3403LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit. Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.

[4] Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computational Media - People-Film & Media Studies

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		3
Any LMC HUM		3
Core D - Science, Math, & Technology		
Lab Science		8
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [4]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
PSYC 1101	General Psychology	3
Any SS		6
Core F - Courses Related to Major		
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
CS 2340	Objects and Design [1]	3
LMC 2700	Introduction to Computational Media [1]	3
MATH 2550	Introduction to Multivariable Calculus [4]	2
Major Requirement		
CS 2261	Media Device Architectures [1]	4
CS 4001	Computing, Society, and Professionalism	3
or CS 4726	Privacy, Technology, Policy, and Law	
or SLS 311(	Technology and Sustainable Community Development	
Junior Design Option (Capstone)		
Junior Design Option [1,3]		6
People Requirements		
PSYC 2015	Research Methods [1]	4
CS 3750	Human Computer Interface Design and Evaluation	3
Social/Behavioral Science (select one): [1]		3
PSYC 2210	Social Psychology	
PSYC 2760	Human Language Processing	
PSYC 3040	Sensation and Perception	
Human-Centered Technology (select two): [1]		6
CS 3790	Introduction to Cognitive Science	
CS 4460	Introduction to Information Visualization	
CS 4470	Introduction to User Interface Software	
CS 4472	Design of Online Communities	
CS 4605	Mobile and Ubiquitous Computing	
CS 4660	Introduction to Educational Technology	
CS 4745	Information and Communication Technologies and Global Development	
Film & Media Studies Requirements		
LMC 2400	Introduction to Media Studies [1]	3

LMC 4813	Special Topics (Media/Design Capstone) [1]	3
Film and Media Making course: [1]		3
LMC 4720	Interactive Narrative	
Any LMC 27XX, 37XX		
Film and Media Studies courses: [1]		9
LMC 2400	Introduction to Media Studies	
LMC 2500	Introduction to Film	
LMC 2600	Introduction to Performance Studies	
LMC 3206	Communication and Culture	
LMC 3248	Poetry and Digital Culture	
LMC 3314	Technologies of Representation	
LMC 3352	Film and/as Technology	
LMC 3362	Science, Technology and Performance	
LMC 3402	Graphic and Visual Design	
LMC 3406	Video Production	
Any LMC 325X		
Any LMC 38XX		
CM or LMC Courses [1]		9
Any LMC 2XXX, 3XXX, 4XXX		
Free Electives		
Free Electives		2
Total Credit Hours		**122**

Pass Fail is allowed for courses in core areas C, D, E and Free.

1 Minimum grade of C required.

3 Junior Design Options are as follows (students must pick one option and may not change):

- Option 1 - LMC 3432, LMC 3431, CS 3311CS 3311, CS 3312CS 3312.
- Option 2 - ECE VIP courses and LMC 3403LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option
- Option 4- CS 2701CS 2701 (3 hours), CS 4699CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours), LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit. Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.

4 Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computational Media - People-Games

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		3
Any LMC HUM		3
Core D - Science, Math, & Technology		
Lab Science		8
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [4]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
PSYC 1101	General Psychology	3
Any SS		6
Core F - Courses Related to Major		
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
CS 2340	Objects and Design [1]	3
LMC 2700	Introduction to Computational Media [1]	3
MATH 2550	Introduction to Multivariable Calculus [4]	2
Major Requirement		
CS 2261	Media Device Architectures [1]	4
CS 4001	Computing, Society, and Professionalism	3
or CS 4726	Privacy, Technology, Policy, and Law	
or SLS 311(	Technology and Sustainable Community Development	
Junior Design Option (Capstone)		
Junior Design Option [1,3]		6
People Requirements		
PSYC 2015	Research Methods [1]	4
CS 3750	Human Computer Interface Design and Evaluation	3
Social/Behavioral Science (select one): [1]		3
PSYC 2210	Social Psychology	
PSYC 2760	Human Language Processing	
PSYC 3040	Sensation and Perception	
Human-Centered Techology (select two): [1]		6
CS 3790	Introduction to Cognitive Science	
CS 4460	Introduction to Information Visualization	
CS 4470	Introduction to User Interface Software	

CS 4472	Design of Online Communities	
CS 4605	Mobile and Ubiquitous Computing	
CS 4660	Introduction to Educational Technology	
CS 4745	Information and Communication Technologies and Global Development	
Games Requirements		
LMC 2410	Introduction to Game Studies [1]	3
LMC 4710	Game Studio [1]	3
CS 3600	Introduction to Artificial Intelligence [1]	3
Design course: [1]		3
LMC 2730	Constructing the Moving Image	
LMC 3710	Principles of Interaction Design	
Game Design courses: [1]		9
LMC 4720	Interactive Narrative	
LMC 4725	Games Design as a Cultural Practice	
LMC 4730	Experimental Digital Art	
LMC 4731	Game AI	
CM or Media Courses [1]		6
LMC 2400	Introduction to Media Studies	
LMC 2500	Introduction to Film	
LMC 3206	Communication and Culture	
LMC 3314	Technologies of Representation	
LMC 3362	Science, Technology and Performance	
LMC 3406	Video Production	
LMC 3402	Graphic and Visual Design	
LMC 3853	Special Topics in Film	
Any LMC 27XX, 37XX, 47XX, 325X		
Free Electives		
Free Electives		2
Total Credit Hours		**122**

Pass Fail is allowed for courses in core areas C, D, E and Free.

[1] Minimum grade of C required.

[3] Junior Design Options are as follows (students must pick one option and may not change):

- Option 1 - LMC 3432LMC 3432, LMC 3431, CS 3311CS 3311, CS 3312CS 3312.
- Option 2 - ECE VIP courses and LMC 3403LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option
- Option 4- CS 2701CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours), LMC 3403LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit. Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.

[4] Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

BACHELOR OF SCIENCE IN COMPUTER ENGINEERING

The School of Electrical and Computer Engineering offers two undergraduate degree programs: electrical engineering (EE) and computer engineering (CmpE). Both programs include elective hours, enabling students to individually tailor their programs to provide emphasis in a particular specialization or exposure to a broad range of subjects. Engineering analysis and design concepts are integrated throughout both programs, culminating in a common major design experience involving a broad range of issues including economic and societal considerations.

The field of computer engineering is centered in digital design, computer architecture, computer networks and internetworking, and computer applications. The BS CmpE program offers elective courses in a wide variety of specializations, including computer architecture; embedded systems and software; design tools, test, and verification; computer networks and internetworking; distributed systems and software; and VLSI design. Additionally, students may elect to take advanced courses in other EE specializations, computer science, or programs, such as mathematics, physics, or management. As an alternative to the BS CmpE degree, students may choose a computer engineering specialization within the BS EE degree program.

Program Educational Objectives

Within five years after graduating, the Georgia Institute of Technology School of Electrical and Computer Engineering graduates will have the skills, knowledge, and choices to:

- Be successful and recognized **leaders** in professional practice in electrical and computer engineering or in related fields.
- Be adaptive-learners and life-long **innovators** through advanced education/degrees, strategic professional development, and entrepreneurship that focuses on the needs of stakeholders.
- Be **problem solvers** who consider global, societal, and environmental impact and are prepared to address problems that are beyond conventional technical understanding and knowledge. Graduates will demonstrate technical competence, ethical reasoning, and creativity in identifying, formulating, analyzing, and developing solutions using appropriate techniques, skills, and tools.
- Be **team builders**, who lead and participate in culturally diverse teams and promote breadth of perspectives in developing, communicating, and executing solutions.

Cybersecurity and Distributed System & Software Design

Cybersecurity and Computing Hardware & Emerging Architectures

Cybersecurity and Signal & Information Processing

Cybersecurity and Telecommunications

Cybersecurity and Robotics & Autonomous Systems

Cybersecurity and Systems & Architecture

Cybersecurity and Devices

Cybersecurity and Information Internetworks

Computing Hardware & Emerging Architectures and Signal & Information Processing

Computing Hardware & Emerging Architectures and Telecommunications

Computing Hardware & Emerging Architectures and Robotics & Autonomous Systems

Computing Hardware & Emerging Architectures and Systems & Architecture

Computing Hardware & Emerging Architectures and Devices

Computing Hardware & Emerging Architectures and Information Internetworks

Distributed System & Software Design and Telecommunications

Distributed System & Software Design and Systems & Architecture

Distributed System & Software Design and Signal & Information Processing

Distributed System & Software Design and Robotics & Autonomous Systems

Distributed System & Software Design and Information Internetworks

Distributed System & Software Design and Computing Hardware & Emerging Architectures

Distributed System & Software Design and Devices

Cooperative Plan

The Georgia Tech Undergraduate Cooperative Education Program allows students to combine classroom study with paid practical work experience directly related to the academic major. Co-ops alternate semesters of on-campus study with semesters of full-time employment, normally beginning the program as freshmen or sophomores. Over 30 percent of ECE undergraduates participate in the co-op program.

The degree requirements for students in the co-op program are the same as those for other students in the major. The Cooperative Plan designation may be pursued separately or in combination with the International Plan and/or the Research Option.

Begun in 1912, Georgia Tech's program is currently the largest optional co-op program in the United States and has perennially been listed in U.S. News & World Report as one of the top ten co-op programs in America. As an integral part of the overall education experience, the co-op program allows students to take on increasing levels of responsibility and to use their job knowledge and classroom learning to make meaningful contributions to the organizations in which they work. Many co-op graduates are hired by their co-op employer, and more than 700 companies or government organizations throughout the United States and abroad currently employ Georgia Tech Undergrad Co-op Program students.

Because the School of ECE in Atlanta offers a wide range of electives and almost all required courses every term, including summer, co-op students have substantial flexibility in completing their degree requirements. Many students continue their co-op work assignments through the senior year. Additionally, co-op students working in the Atlanta area may be able to take certain ECE courses, particularly laboratories offered in the evening, during the work term.

In addition to the co-op program, the Center for Career Discovery and Development also offers the Undergraduate Professional Internship and Work Abroad programs. These programs also provide opportunities for students to gain practical work experience, without the long-term commitment of the co-op program.

Center for Career Discovery and Development

International Plan

The International Plan is intended for students who seek an intensive international experience integrated into their undergraduate studies in computer engineering. The International Plan develops global competence through a combination of coursework, language study, and residential overseas experience. Students who complete this option receive a designation on their transcript and diploma.

The computer engineering aspects of the BS CmpE - International Plan degree requirements are identical to those for the regular BS CmpE . Please refer to the BS CmpE catalog description for general information about the degree program. Students may be able to satisfy the additional requirements imposed for the International Plan designation through appropriate choices of electives without additional credit hours to complete the degree. The International Plan designation may be pursued separately, or in combination with the Cooperative Plan and/or the Research Option.

The School of Electrical and Computer Engineering offers a junior-year program at the Georgia Tech-Europe campus in Metz, France, that is designed to facilitate participation in the International Plan. However, computer engineering majors are not restricted to this option and may complete any allowable courses, languages, and overseas experiences that satisfy the International Plan requirements.

Research Option

The Research Option is intended for students who seek a concentrated research experience, culminating in an undergraduate thesis, integrated into their undergraduate studies in computer engineering. This option includes three or four semesters of structured research and provides an open evaluation of a student's research capabilities, viewable by the public via a required Web-based research portfolio. Students who complete this option receive a designation on their transcript.

The computer engineering aspects of the BS CmpE-Research Option degree requirements are identical to those for the regular BS CmpE . Please refer to the BS CmpE catalog description for general information about the degree program. Students may be able to satisfy the additional requirements imposed for the Research Option designation through appropriate choices of electives without additional credit hours to complete the degree. The Research Option designation may be pursued separately, or in combination with the Cooperative Plan and/or the International Plan.

The School of Electrical and Computer Engineering (ECE) offers a two-semester Undergraduate Research Opportunity Program (UROP), which may be completed to provide a less-intensive research experience or as the initial phase of the Research Option. Contact the ECE Academic Office for additional information about the Research Option, including specific Institute and ECE requirements, and assistance in planning your schedule to allow participation in this program.

BS/MS Electrical and Computer Engineering

This program allows highly qualified students to receive the Bachelor of Science in either Electrical Engineering or Computer Engineering and a master's degree in Electrical and Computer Engineering. The joint BS/MS degree program affords undergraduate electrical or computer engineering majors the opportunity to broaden their studies and improve their career prospects.

Eligible Georgia Tech undergraduates normally apply for this program during their junior year. Contact the Electrical and Computer Engineering Graduate Affairs Office for program information, eligibility requirements, and applications.

BSMS Information

Dual BS in Computer Engineering

Georgia Tech & Korea Advanced Institute of Science & Tech

Students may pursue the BSEE degree from the Korea Advanced Institute of Science and Technology (KAIST) as they earn the BSEE or BSCmpE from Georgia Tech. KAIST offers one of the top engineering programs in Korea and the Far East. All lectures at KAIST are given in English to better serve a growing number of students from overseas. While earning their dual degrees, students spend two years each at both Georgia Tech and KAIST.

Bachelor of Science in Computer Engineering - Computing Hardware & Emerging Architectures and Devices

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Choose one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	

INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Choose one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
CS 1331	Introduction to Object Oriented Programming [2]	3
CS 1332	Data Structures and Algorithms for Applications [2]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [2]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [2]	2
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Ethics [1]		
Probability/Statistics [4,9]		3
Major Requirements		
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
ECE 2040	Circuit Analysis [2]	3
ECE 3058	Architecture, Systems, Concurrency, and Energy in Computation [2]	4
Computing Hardware & Emerging Architectures [2,6,9]		
ECE 3150	VLSI and Advanced Digital Design	4
ECE 3030	Physical Foundations of Computer Engineering	3
Select three of the following: [2,6]		9
CS 4220	Programming Embedded Systems	
ECE 4180	Embedded Systems Design	
ECE 4181	Embedded Computing Systems	
ECE 4130	Advanced VLSI Systems	
ECE 4420	Digital Integrated Circuits	
ECE 4452	IC Fabrication	
ECE 4460	Introduction to Electronic Systems Packaging	
ECE 4100	Advanced Computer Architecture	
ECE 4150	Cloud Computing	
Devices [2,6,9]		
CS 2340	Objects and Design	3
CS 3251	Computer Networking I	3
CS 3510	Design and Analysis of Algorithms	3
or CS 3511	Design and Analysis of Algorithms, Honors	
Select one of the following (Building Devices): [2,6]		4
CS 3651	Prototyping Intelligent Devices	
ECE 4180	Embedded Systems Design	
Select one of the following (Devices in the Real World): [2,6]		3
CS 3630	Introduction to Perception and Robotics	
CS 4261	Mobile Applications and Services for Converged Networks	
CS 4476	Introduction to Computer Vision	
CS 4605	Mobile and Ubiquitous Computing	
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [5]		3
Free Electives [3,7]		**7**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005

Courses that are cross-listed with ECE must be taken under the ECE number.

[1] Student must complete one Ethics course during their program. For a complete list of Ethics courses, please see the Ethics Catalog page.

[2] Minimum grade of C required

[3] The following courses are not allowed: HPS 1XXX, PHYS 2XXX (AP Credit), ECE 3710, ECE 3741, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113. Maximum of six credit hours of Special Problems or research may be applied toward the degree

[4] CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (Must be taken on Letter/Grade basis)

[5] Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

[6] No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE/CS 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[7] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (5)

[8] ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals

Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).

2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

[9] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Computer Engineering - Computing Hardware & Emerging Architectures and Information Internetworks

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Choose one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Choose one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
CS 1331	Introduction to Object Oriented Programming [2]	3
CS 1332	Data Structures and Algorithms for Applications [2]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [2]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [2]	2
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Ethics [1]		
Probability/Statistics [4,9]		3
Major Requirements		
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
ECE 2040	Circuit Analysis [2]	3
ECE 3058	Architecture, Systems, Concurrency, and Energy in Computation [2]	4
Computing Hardware & Emerging Architectures [2,6,9]		
ECE 3150	VLSI and Advanced Digital Design	4
ECE 3030	Physical Foundations of Computer Engineering	3
Select three of the following: [2,6]		9
CS 4220	Programming Embedded Systems	
ECE 4180	Embedded Systems Design	
ECE 4181	Embedded Computing Systems	
ECE 4130	Advanced VLSI Systems	
ECE 4420	Digital Integrated Circuits	
ECE 4452	IC Fabrication	
ECE 4460	Introduction to Electronic Systems Packaging	
ECE 4100	Advanced Computer Architecture	
ECE 4150	Cloud Computing	
Information Internetworks [2,6,9]		
CS 2340	Objects and Design	3
CS 3510	Design and Analysis of Algorithms	3
or CS 3511	Design and Analysis of Algorithms, Honors	
Select two of the following (Introduction to Information Management): [2,6]		6
CS 4235	Introduction to Information Security	
CS 3251	Computer Networking I	
CS 4400	Introduction to Database Systems	
Select one of the following (Advanced Information Management): [2,6]		3
CS 4237	Computer and Network Security	
CS 4251	Computer Networking II	
CS 4255	Introduction to Network Management	
CS 4261	Mobile Applications and Services for Converged Networks	
CS 4270	Data Communications Laboratory	
CS 4365	Introduction to Enterprise Computing	
CS 4420	Database System Implementation	

CS 4440	Emerging Database Technologies and Applications	
CS 4675	Internet Computing Systems, Services and Applications	
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [5]		3
Free Electives [3,7]		**8**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005

Courses that are cross-listed with ECE must be taken under the ECE number.

[1] Student must complete one Ethics course during their program. For a complete list of Ethics courses, please see the Ethics Catalog page.

[2] Minimum grade of C required

[3] The following courses are not allowed: HPS 1XXX, PHYS 2XXX (AP Credit), ECE 3710, ECE 3741, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113. Maximum of six credit hours of Special Problems or research may be applied toward the degree

[4] CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (Must be taken on Letter/Grade basis)

[5] Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

[6] No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE/CS 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[7] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (5)

[8] ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

[9] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Computer Engineering - Computing Hardware & Emerging Architectures and Robotics & Autonomous Systems

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Choose one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Choose one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
CS 1331	Introduction to Object Oriented Programming [2]	3
CS 1332	Data Structures and Algorithms for Applications [2]	3

CS 2050	Introduction to Discrete Mathematics for Computer Science [2]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [2]	2
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Ethics [1]		
Probability/Statistics [4,9]		3
Major Requirements		
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
ECE 2040	Circuit Analysis [2]	3
ECE 3058	Architecture, Systems, Concurrency, and Energy in Computation [2]	4
Computing Hardware & Emerging Architectures [2,6,9]		
ECE 3150	VLSI and Advanced Digital Design	4
ECE 3030	Physical Foundations of Computer Engineering	3
Select three of the following: [2,6]		9
CS 4220	Programming Embedded Systems	
ECE 4180	Embedded Systems Design	
ECE 4181	Embedded Computing Systems	
ECE 4130	Advanced VLSI Systems	
ECE 4420	Digital Integrated Circuits	
ECE 4452	IC Fabrication	
ECE 4460	Introduction to Electronic Systems Packaging	
ECE 4100	Advanced Computer Architecture	
ECE 4150	Cloud Computing	
Robotics & Autonomous Systems [2,6,9]		
ECE 2026	Introduction to Signal Processing	3
ECE 3550	Feedback Control Systems	3
ECE 4550	Control System Design	4
Select one of the following Robotics & Autonomous Systems Tools): [2,6]		3
ECE 3084	Signals and Systems	
ECE 4560	Introduction to Automation and Robotics	
ECE 4580	Computational Computer Vision	
ECE 4570	System Theory for Communication and Control	
Robotics & Autonomous Systems Electives		
ECE 3000/4000-level Electives [8]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [5]		3
Free Electives [3,7]		**7**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005

Courses that are cross-listed with ECE must be taken under the ECE number.

[1] Student must complete one Ethics course during their program. For a complete list of Ethics courses, please see the Ethics Catalog page.

[2] Minimum grade of C required

[3] The following courses are not allowed: HPS 1XXX, PHYS 2XXX (AP Credit), ECE 3710, ECE 3741, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113. Maximum of six credit hours of Special Problems or research may be applied toward the degree

[4] CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (Must be taken on Letter/Grade basis)

[5] Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

[6] No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE/CS 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[7] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (5)

[8] ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

[9] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Computer Engineering - Computing Hardware & Emerging Architectures and Signal & Information Processing

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Choose one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Choose one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
CS 1331	Introduction to Object Oriented Programming [2]	3
CS 1332	Data Structures and Algorithms for Applications [2]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [2]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [2]	2
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Ethics [1]		
Probability/Statistics [4,9]		3
Major Requirements		
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
ECE 2040	Circuit Analysis [2]	3
ECE 3058	Architecture, Systems, Concurrency, and Energy in Computation [2]	4
Computing Hardware & Emerging Architectures [2,6,9]		
ECE 3150	VLSI and Advanced Digital Design	4
ECE 3030	Physical Foundations of Computer Engineering	3
Select three of the following: [2,6]		9
CS 4220	Programming Embedded Systems	
ECE 4180	Embedded Systems Design	
ECE 4181	Embedded Computing Systems	
ECE 4130	Advanced VLSI Systems	
ECE 4420	Digital Integrated Circuits	
ECE 4452	IC Fabrication	
ECE 4460	Introduction to Electronic Systems Packaging	
ECE 4100	Advanced Computer Architecture	
ECE 4150	Cloud Computing	
Signal & Information Processing [2,6,9]		
ECE 2026	Introduction to Signal Processing	3
Select one of the following (Signal & Processing Topics): [2,6]		3
ECE 3251	Optimization for Information Systems	
ECE 4270	Fundamentals of Digital Signal Processing	
Select two of the following: [2,6]		6
ECE 3084	Signals and Systems	
ECE 3251	Optimization for Information Systems	
ECE 4122	Advanced Programming Techniques for Engineering Applications	
ECE 4180	Embedded Systems Design	
ECE 4260	Random Signals and Applications	
ECE 4270	Fundamentals of Digital Signal Processing	
ECE 4271	Applications of Digital Signal Processing	
ECE 4273	Design Synthesis of Application-specific Signal Processors	
ECE 4783	Introduction to Medical Image Processing	
Signal & Information Processing Electives		
ECE 3000/4000-level Elective [8]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [5]		3
Free Electives [3,7]		**8**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005

Courses that are cross-listed with ECE must be taken under the ECE number.

[1] Student must complete one Ethics course during their program. For a complete list of Ethics courses, please see the Ethics Catalog page.

[2] Minimum grade of C required

[3] The following courses are not allowed: HPS 1XXX, PHYS 2XXX (AP Credit), ECE 3710, ECE 3741, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113. Maximum of six credit hours of Special Problems or research may be applied toward the degree

[4] CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (Must be taken on Letter/Grade basis)

[5] Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

[6] No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE/CS 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[7] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (5)

[8] ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

[9] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Computer Engineering - Computing Hardware & Emerging Architectures and Systems & Architecture

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Choose one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Choose one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
CS 1331	Introduction to Object Oriented Programming [2]	3
CS 1332	Data Structures and Algorithms for Applications [2]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [2]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [2]	2
MATH 2552	Differential Equations [2]	4

CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Ethics [1]		
Probability/Statistics [4,9]		3
Major Requirements		
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
ECE 2040	Circuit Analysis [2]	3
ECE 3058	Architecture, Systems, Concurrency, and Energy in Computation [2]	4
Computing Hardware & Emerging Architectures [2,6,9]		
ECE 3150	VLSI and Advanced Digital Design	4
ECE 3030	Physical Foundations of Computer Engineering	3
Select three of the following: [2,6]		9
CS 4220	Programming Embedded Systems	
ECE 4180	Embedded Systems Design	
ECE 4181	Embedded Computing Systems	
ECE 4130	Advanced VLSI Systems	
ECE 4420	Digital Integrated Circuits	
ECE 4452	IC Fabrication	
ECE 4460	Introduction to Electronic Systems Packaging	
ECE 4100	Advanced Computer Architecture	
ECE 4150	Cloud Computing	
Systems & Architecture [2,6,9]		
CS 2340	Objects and Design	3
CS 3210	Design of Operating Systems	3
CS 3220	Computer Structures: Hardware/Software Codesign of a Processor	3
CS 3510	Design and Analysis of Algorithms	3
or CS 3511	Design and Analysis of Algorithms, Honors	
Select one of the following (Systems Software Tools): [2,6]		3
CS 3300	Introduction to Software Engineering	
CS 4240	Compilers, Interpreters, and Program Analyzers	
Select one of the following (Advanced Systems & Architecture): [2,6]		3
CS 4210	Advanced Operating Systems	
CS 4220	Programming Embedded Systems	
ECE 4100	Advanced Computer Architecture	
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [5]		3
Free Electives [3,7]		**5**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005

Courses that are cross-listed with ECE must be taken under the ECE number.

1 Student must complete one Ethics course during their program. For a complete list of Ethics courses, please see the Ethics Catalog page.

2 Minimum grade of C required

3 The following courses are not allowed: HPS 1XXX, PHYS 2XXX (AP Credit), ECE 3710, ECE 3741, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113. Maximum of six credit hours of Special Problems or research may be applied toward the degree

4 CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (Must be taken on Letter/Grade basis)

5 Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

6 No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE/CS 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

7 The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (5)

8 ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

9 Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Computer Engineering - Computing Hardware & Emerging Architectures and Telecommunications

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	

Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Choose one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Choose one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
CS 1331	Introduction to Object Oriented Programming [2]	3
CS 1332	Data Structures and Algorithms for Applications [2]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [2]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [2]	2
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Ethics [1]		
Probability/Statistics [4,9]		3
Major Requirements		
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [3]	4
ECE 2040	Circuit Analysis [3]	3
ECE 3058	Architecture, Systems, Concurrency, and Energy in Computation [2]	4
Computing Hardware & Emerging Architectures [2,6,9]		
ECE 3150	VLSI and Advanced Digital Design	4
ECE 3030	Physical Foundations of Computer Engineering	3
Select three of the following: [2,6]		9
CS 4220	Programming Embedded Systems	
ECE 4180	Embedded Systems Design	
ECE 4181	Embedded Computing Systems	
ECE 4130	Advanced VLSI Systems	
ECE 4420	Digital Integrated Circuits	
ECE 4452	IC Fabrication	
ECE 4460	Introduction to Electronic Systems Packaging	
ECE 4100	Advanced Computer Architecture	
ECE 4150	Cloud Computing	
Telecommunications [2,6,9]		
ECE 2026	Introduction to Signal Processing	3
Select one of the following: [2,6]		3
ECE 3600	Computer Communications	
CS 3251	Computer Networking I	
Select one of the following: [2,6]		3
ECE 4601	Communication Systems	
ECE 4606	Wireless Communications	
Select one of the following: [2,6]		3
ECE 3084	Signals and Systems	
ECE 4350	Electromagnetic and Microwave Applications	
ECE 4370	Antenna Engineering	
ECE 4500	Optical Engineering	
ECE 4601	Communication Systems	
ECE 4605	Topics in Networks	
ECE 4606	Wireless Communications	
ECE 4607	Mobile and Wireless Networks	
Telecommunication Electives [2,6]		
ECE 3000/4000-level Elective [8]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [5]		3
Free Electives [3,7]		**8**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005

Courses that are cross-listed with ECE must be taken under the ECE number.

1. Student must complete one Ethics course during their program. For a complete list of Ethics courses, please see the Ethics Catalog page.
2. Minimum grade of C required
3. The following courses are not allowed: HPS 1XXX, PHYS 2XXX (AP Credit), ECE 3710, ECE 3741, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113. Maximum of six credit hours of Special Problems or research may be applied toward the degree
4. CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (Must be taken on Letter/Grade basis)
5. Senior Design requirements may be satisfied in the following ways:
   1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II

2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

[6] No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE/CS 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[7] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (5)

[8] ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

[9] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Computer Engineering- Cybersecurity and Computing Hardware & Emerging Architectures

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Choose one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Choose one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
CS 1331	Introduction to Object Oriented Programming [2]	3
CS 1332	Data Structures and Algorithms for Applications [2]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [2]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [2]	2
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Ethics [1]		
Probability/Statistics [4,9]		3
Major Requirements		
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
ECE 2040	Circuit Analysis [2]	3
ECE 3058	Architecture, Systems, Concurrency, and Energy in Computation [2]	4
Cybersecurity [2,6,9]		
ECE 4115	Introduction to Computer Security	4
Select one of the following: [2]		3
CS 3251	Computer Networking I	
ECE 3600	Computer Communications	
Select two of the following (Cybersecurity Topics): [2,6]		6

ECE 3170	Cryptographic Hardware for Embedded Systems	
ECE 4112	Internetwork Security	
ECE 4117	Introduction to Malware Reverse Engineering	
ECE 4147	Adv Malware Analysis	
ECE 4156	Hardware-Oriented Security and Trust	
Computing Hardware & Emerging Architectures [2,6,9]		
ECE 3150	VLSI and Advanced Digital Design	4
ECE 3030	Physical Foundations of Computer Engineering	3
Select three of the following: [2,6]		9
CS 4220	Programming Embedded Systems	
ECE 4180	Embedded Systems Design	
ECE 4181	Embedded Computing Systems	
ECE 4130	Advanced VLSI Systems	
ECE 4452	IC Fabrication	
ECE 4420	Digital Integrated Circuits	
ECE 4460	Introduction to Electronic Systems Packaging	
ECE 4100	Advanced Computer Architecture	
ECE 4150	Cloud Computing	
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [5]		3
Free Electives [3,7]		**10**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005

Courses that are cross-listed with ECE must be taken under the ECE number.

[1] Student must complete one Ethics course during their program. For a complete list of Ethics courses, please see the Ethics Catalog page.

[2] Minimum grade of C required

[3] The following courses are not allowed: HPS 1XXX, PHYS 2XXX (AP Credit), ECE 3710, ECE 3741, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113. Maximum of six credit hours of Special Problems or research may be applied toward the degree

[4] CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (Must be taken on Letter/Grade basis)

[5] Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

[6] No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE/CS 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[7] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (5)

[8] ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

[9] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Computer Engineering - Cybersecurity and Devices

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Choose one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	

PUBP 3000	American Constitutional Issues	
Choose one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
CS 1331	Introduction to Object Oriented Programming [2]	3
CS 1332	Data Structures and Algorithms for Applications [2]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [2]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [2]	2
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 1211	Chemical Principles I	
Ethics [1]		
Probability/Statistics [4,9]		3
Major Requirements		
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
ECE 2040	Circuit Analysis [2]	3
ECE 3058	Architecture, Systems, Concurrency, and Energy in Computation [2]	4
Cybersecurity [2,6,9]		
ECE 4115	Introduction to Computer Security	4
Select one of the following: [2]		3
CS 3251	Computer Networking I	
ECE 3600	Computer Communications	
Select two of the following (Cybersecurity Topics): [2,6]		7
ECE 3170	Cryptographic Hardware for Embedded Systems	
ECE 4112	Internetwork Security	
ECE 4117	Introduction to Malware Reverse Engineering	
ECE 4147	Adv Malware Analysis	
Devices [2,6,9]		
CS 2340	Objects and Design	3
CS 3251	Computer Networking I	3
CS 3510	Design and Analysis of Algorithms	3
or CS 3511	Design and Analysis of Algorithms, Honors	
Select one of the following (Building Devices): [2,6]		4
CS 3651	Prototyping Intelligent Devices	
ECE 4180	Embedded Systems Design	
Select one of the following (Devices in the Real World): [2,6]		3
CS 3630	Introduction to Perception and Robotics	
CS 4261	Mobile Applications and Services for Converged Networks	
CS 4476	Introduction to Computer Vision	
CS 4605	Mobile and Ubiquitous Computing	
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [5]		3
Free Electives [3,7]		**9**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005

Courses that are cross-listed with ECE must be taken under the ECE number.

[1] Student must complete one Ethics course during their program. For a complete list of Ethics courses, please see the Ethics Catalog page.

[2] Minimum grade of C required

[3] The following courses are not allowed: HPS 1XXX, PHYS 2XXX (AP Credit), ECE 3710, ECE 3741, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113. Maximum of six credit hours of Special Problems or research may be applied toward the degree

[4] CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (Must be taken on Letter/Grade basis)

[5] Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

[6] No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE/CS 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[7] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (5)

[8] ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option

but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

[9] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Computer Engineering - Cybersecurity and Distributed System & Software Design

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 1035	The Science of Physical Activity and Health	
or APPH 1036	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Choose one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Choose one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
CS 1331	Introduction to Object Oriented Programming [2]	3
CS 1332	Data Structures and Algorithms for Applications [2]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [2]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [2]	2
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 1211K	Chemical Principles I	
Ethics [1]		
Probability/Statistics [4,9]		3
Major Requirements		
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
ECE 2040	Circuit Analysis [2]	3
ECE 3058	Architecture, Systems, Concurrency, and Energy in Computation [2]	4
Cybersecurity [2,6,9]		
ECE 4115	Introduction to Computer Security	4
Select one of the following: [2]		3
CS 3251	Computer Networking I	
ECE 3600	Computer Communications	
Select two of the following (Cybersecurity Topics): [2,6]		7
ECE 3170	Cryptographic Hardware for Embedded Systems	
ECE 4112	Internetwork Security	
ECE 4117	Introduction to Malware Reverse Engineering	
ECE 4147	Adv Malware Analysis	
ECE 4156	Hardware-Oriented Security and Trust	
Distributed System & Software Design [2,6,9]		
CS 3251	Computer Networking I	3
Select three of the following (Advanced Software): [2,6]		9
CS 4220	Programming Embedded Systems	
ECE 4122	Advanced Programming Techniques for Engineering Applications	
ECE 4795	GPU Programming for Video Games	
ECE 4150	Cloud Computing	
ECE 4180	Embedded Systems Design	
CS 4605	Mobile and Ubiquitous Computing	
CS 3651	Prototyping Intelligent Devices	
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [5]		3
Free Electives [3,7]		**13**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005

Courses that are cross-listed with ECE must be taken under the ECE number.

[1] Student must complete one Ethics course during their program. For a complete list of Ethics courses, please see the Ethics Catalog page.

[2] Minimum grade of C required

[3] The following courses are not allowed: HPS 1XXX, PHYS 2XXX (AP Credit), ECE 3710, ECE 3741, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113. Maximum of six credit hours of Special Problems or research may be applied toward the degree

[4] CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (Must be taken on Letter/Grade basis)

[5] Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

[6] No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE/CS 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[7] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (5)

[8] ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

[9] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Computer Engineering - Cybersecurity and Information Internetworks

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Choose one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Choose one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
CS 1331	Introduction to Object Oriented Programming [2]	3
CS 1332	Data Structures and Algorithms for Applications [2]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [2]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [2]	2
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Ethics [1]		
Probability/Statistics [4,9]		3
Major Requirements		
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
ECE 2040	Circuit Analysis [2]	3
ECE 3058	Architecture, Systems, Concurrency, and Energy in Computation [2]	4
Cybersecurity [2,6,9]		

ECE 4115	Introduction to Computer Security	4
Select one of the following: [2]		3
CS 3251	Computer Networking I	
ECE 3600	Computer Communications	
Select two of the following (Cybersecurity Topics): [2,6]		7
ECE 3170	Cryptographic Hardware for Embedded Systems	
ECE 4112	Internetwork Security	
ECE 4117	Introduction to Malware Reverse Engineering	
ECE 4147	Adv Malware Analysis	
ECE 4156	Hardware-Oriented Security and Trust	
Information Internetworks [2,6,9]		
CS 2340	Objects and Design	3
CS 3510	Design and Analysis of Algorithms	3
or CS 3511	Design and Analysis of Algorithms, Honors	
Select two of the following (Introduction to Information Management): [2,6]		6
CS 3251	Computer Networking I	
CS 4235	Introduction to Information Security	
CS 4400	Introduction to Database Systems	
Select one of the following (Advanced Information Management): [2,6]		3
CS 4237	Computer and Network Security	
CS 4251	Computer Networking II	
CS 4255	Introduction to Network Management	
CS 4261	Mobile Applications and Services for Converged Networks	
CS 4270	Data Communications Laboratory	
CS 4365	Introduction to Enterprise Computing	
CS 4420	Database System Implementation	
CS 4440	Emerging Database Technologies and Applications	
CS 4675	Internet Computing Systems, Services and Applications	
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [5]		3
Free Electives [3,7]		**10**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005

Courses that are cross-listed with ECE must be taken under the ECE number.

[1] Student must complete one Ethics course during their program. For a complete list of Ethics courses, please see the Ethics Catalog page.

[2] Minimum grade of C required

[3] The following courses are not allowed: HPS 1XXX, PHYS 2XXX (AP Credit), ECE 3710, ECE 3741, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113. Maximum of six credit hours of Special Problems or research may be applied toward the degree

[4] CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (Must be taken on Letter/Grade basis)

[5] Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

[6] No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE/CS 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[7] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (5)

[8] ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

[9] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Computer Engineering - Cybersecurity and Robotics & Autonomous Systems

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3

Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Choose one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Choose one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
CS 1331	Introduction to Object Oriented Programming [2]	3
CS 1332	Data Structures and Algorithms for Applications [2]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [2]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [2]	2
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 1211	Chemical Principles I	
Ethics [1]		
Probability/Statistics [4,9]		3
Major Requirements		
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
ECE 2040	Circuit Analysis [2]	3
ECE 3058	Architecture, Systems, Concurrency, and Energy in Computation [2]	4
Cybersecurity [2,6,9]		
ECE 4115	Introduction to Computer Security	4
Select one of the following: [2]		3
CS 3251	Computer Networking I	
ECE 3600	Computer Communications	
Select two of the following (Cybersecurity Topics): [2,6]		7
ECE 3170	Cryptographic Hardware for Embedded Systems	
ECE 4112	Internetwork Security	
ECE 4117	Introduction to Malware Reverse Engineering	
ECE 4147	Adv Malware Analysis	
ECE 4156	Hardware-Oriented Security and Trust	
Robotics & Autonomous Systems [2,6,9]		
ECE 2026	Introduction to Signal Processing	3
ECE 3550	Feedback Control Systems	3
ECE 4550	Control System Design	4
Select one of the following (Robotics & Autonomous Systems Topics): [2,6]		3
ECE 3084	Signals and Systems	
ECE 4560	Introduction to Automation and Robotics	
ECE 4570	System Theory for Communication and Control	
ECE 4580	Computational Computer Vision	
Robotics & Autonomous Systems Electives		
ECE 3000/4000-level Elective [8]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [5]		3
Free Electives [3,7]		**9**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005

Courses that are cross-listed with ECE must be taken under the ECE number.

1 Student must complete one Ethics course during their program. For a complete list of Ethics courses, please see the Ethics Catalog page.

2 Minimum grade of C required

3 The following courses are not allowed: HPS 1XXX, PHYS 2XXX (AP Credit), ECE 3710, ECE 3741, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113. Maximum of six credit hours of Special Problems or research may be applied toward the degree

4 CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (Must be taken on Letter/Grade basis)

5 Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

6 No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE/CS 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).

2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[7] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (5)

[8] ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

[9] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Computer Engineering - Cybersecurity and Signal & Information Processing

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Choose one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Choose one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
CS 1331	Introduction to Object Oriented Programming [2]	3
CS 1332	Data Structures and Algorithms for Applications [2]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [2]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [2]	2
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Ethics [1]		
Probability/Statistics [4,9]		3
Major Requirements		
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
ECE 2040	Circuit Analysis [2]	3
ECE 3058	Architecture, Systems, Concurrency, and Energy in Computation [2]	4
Cybersecurity [2,6,9]		
ECE 4115	Introduction to Computer Security	4
Select one of the following: [2]		3
CS 3251	Computer Networking I	
ECE 3600	Computer Communications	
Select two of the following (Cybersecurity Topics): [2,6]		7
ECE 3170	Cryptographic Hardware for Embedded Systems	
ECE 4112	Internetwork Security	
ECE 4117	Introduction to Malware Reverse Engineering	
ECE 4147	Adv Malware Analysis	
ECE 4156	Hardware-Oriented Security and Trust	
Signal & Information Processing [2,6,9]		
ECE 2026	Introduction to Signal Processing	3
Select one of the following (Signal & Information Processing Topics): [2,6]		3
ECE 3251	Optimization for Information Systems	
ECE 4270	Fundamentals of Digital Signal Processing	
Select two of the following: [2,6]		6
ECE 3084	Signals and Systems	
ECE 3251	Optimization for Information Systems	

ECE 4122	Advanced Programming Techniques for Engineering Applications	
ECE 4180	Embedded Systems Design	
ECE 4260	Random Signals and Applications	
ECE 4270	Fundamentals of Digital Signal Processing	
ECE 4271	Applications of Digital Signal Processing	
ECE 4273	Design Synthesis of Application-specific Signal Processors	
ECE 4783	Introduction to Medical Image Processing	
Signal & Information Processing Electives		
ECE 3000/4000-level Elective [8]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [5]		3
Free Electives [3,7]		**10**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005

Courses that are cross-listed with ECE must be taken under the ECE number.

[1] Student must complete one Ethics course during their program. For a complete list of Ethics courses, please see the Ethics Catalog page.

[2] Minimum grade of C required

[3] The following courses are not allowed: HPS 1XXX, PHYS 2XXX (AP Credit), ECE 3710, ECE 3741, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113. Maximum of six credit hours of Special Problems or research may be applied toward the degree

[4] CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (Must be taken on Letter/Grade basis)

[5] Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

[6] No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE/CS 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[7] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (5)

[8] ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

[9] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Computer Engineering - Cybersecurity and Systems & Architecture

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Choose one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Choose one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3

ECE 3005	Professional and Technical Communications for ECE	1
CS 1331	Introduction to Object Oriented Programming [2]	3
CS 1332	Data Structures and Algorithms for Applications [2]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [2]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [2]	2
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 1211K	Chemical Principles I	
Ethics [1]		
Probability/Statistics [4,9]		3
Major Requirements		
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
ECE 2040	Circuit Analysis [2]	3
ECE 3058	Architecture, Systems, Concurrency, and Energy in Computation [2]	4
Cybersecurity [2,6,9]		
ECE 4115	Introduction to Computer Security	4
Select one of the following: [2]		3
CS 3251	Computer Networking I	
ECE 3600	Computer Communications	
Select two of the following (Cybersecurity Topics): [2,6]		7
ECE 3170	Cryptographic Hardware for Embedded Systems	
ECE 4112	Internetwork Security	
ECE 4117	Introduction to Malware Reverse Engineering	
ECE 4147	Adv Malware Analysis	
ECE 4156	Hardware-Oriented Security and Trust	
Systems & Architecture [2,6,9]		
CS 2340	Objects and Design	3
CS 3210	Design of Operating Systems	3
CS 3220	Computer Structures: Hardware/Software Codesign of a Processor	3
CS 3510	Design and Analysis of Algorithms	3
or CS 3511	Design and Analysis of Algorithms, Honors	
Select one of the following (Systems Software Tools): [2,6]		3
CS 3300	Introduction to Software Engineering	
CS 4240	Compilers, Interpreters, and Program Analyzers	
Select one of the following (Advanced Systems & Architecture): [2,6]		3
CS 4210	Advanced Operating Systems	
CS 4220	Programming Embedded Systems	
ECE 4100	Advanced Computer Architecture	
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [5]		3
Free Electives [3,7]		**7**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005

Courses that are cross-listed with ECE must be taken under the ECE number.

[1] Student must complete one Ethics course during their program. For a complete list of Ethics courses, please see the Ethics Catalog page.

[2] Minimum grade of C required

[3] The following courses are not allowed: HPS 1XXX, PHYS 2XXX (AP Credit), ECE 3710, ECE 3741, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113. Maximum of six credit hours of Special Problems or research may be applied toward the degree

[4] CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (Must be taken on Letter/Grade basis)

[5] Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

[6] No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE/CS 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[7] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (5)

[8] ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

[9] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Computer Engineering - Cybersecurity and Telecommunications

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 1005	The Science of Physical Activity and Health	
or APPH 1050	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Choose one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Choose one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
CS 1331	Introduction to Object Oriented Programming [2]	3
CS 1332	Data Structures and Algorithms for Applications [2]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [2]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [2]	2
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 1211	Chemical Principles I	
Ethics [1]		
Probability/Statistics [4,9]		3
Major Requirements		
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
ECE 2040	Circuit Analysis [2]	3
ECE 3058	Architecture, Systems, Concurrency, and Energy in Computation [2]	4
Cybersecurity [2,6,9]		
ECE 4115	Introduction to Computer Security	4
Select one of the following: [2]		3
CS 3251	Computer Networking I	
ECE 3600	Computer Communications	
Select two of the following (Cybersecurity Topics): [2,6]		7
ECE 3170	Cryptographic Hardware for Embedded Systems	
ECE 4112	Internetwork Security	
ECE 4117	Introduction to Malware Reverse Engineering	
ECE 4147	Adv Malware Analysis	
ECE 4156	Hardware-Oriented Security and Trust	
Telecommunications [2,6,9]		
ECE 2026	Introduction to Signal Processing	3
Select one of the following: [2,6]		3
ECE 3600	Computer Communications	
CS 3251	Computer Networking I	
Select one of the following: [2,6]		3
ECE 4601	Communication Systems	
ECE 4606	Wireless Communications	
Select one of the following: [2,6]		3
ECE 3084	Signals and Systems	
ECE 4350	Electromagnetic and Microwave Applications	
ECE 4370	Antenna Engineering	
ECE 4500	Optical Engineering	
ECE 4601	Communication Systems	
ECE 4605	Topics in Networks	
ECE 4606	Wireless Communications	
ECE 4607	Mobile and Wireless Networks	
Telecommunications Electives		
ECE 3000/4000-level Elective [8]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [5]		3
Free Electives [3,7]		**10**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005

Courses that are cross-listed with ECE must be taken under the ECE number.

[1] Student must complete one Ethics course during their program. For a complete list of Ethics courses, please see the Ethics Catalog page.
[2] Minimum grade of C required

[3] The following courses are not allowed: HPS 1XXX, PHYS 2XXX (AP Credit), ECE 3710, ECE 3741, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113. Maximum of six credit hours of Special Problems or research may be applied toward the degree

[4] CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (Must be taken on Letter/Grade basis)

[5] Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

[6] No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE/CS 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[7] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (5)

[8] ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

[9] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Computer Engineering - Distributed System & Software Design and Devices

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Choose one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Choose one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
CS 1331	Introduction to Object Oriented Programming [2]	3
CS 1332	Data Structures and Algorithms for Applications [2]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [2]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [2]	2
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Ethics [1]		
Probability/Statistics [4,9]		3
Major Requirements		
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
ECE 2040	Circuit Analysis [2]	3
ECE 3058	Architecture, Systems, Concurrency, and Energy in Computation [2]	4
Distributed System & Software Design [2,6,9]		

CS 3251	Computer Networking I	3
Select three of the following (Advanced Software): [2,6]		9
CS 4220	Programming Embedded Systems	
ECE 4122	Advanced Programming Techniques for Engineering Applications	
ECE 4795	GPU Programming for Video Games	
ECE 4150	Cloud Computing	
ECE 4180	Embedded Systems Design	
CS 4605	Mobile and Ubiquitous Computing	
CS 3651	Prototyping Intelligent Devices	
Devices [2,6,9]		
CS 2340	Objects and Design	3
CS 3251	Computer Networking I	3
CS 3510	Design and Analysis of Algorithms	3
or CS 3511	Design and Analysis of Algorithms, Honors	
Select one of the following (Building Devices): [2,6]		4
CS 3651	Prototyping Intelligent Devices	
ECE 4180	Embedded Systems Design	
Select one of the following (Devices in the Real World): [2,6]		3
CS 3630	Introduction to Perception and Robotics	
CS 4261	Mobile Applications and Services for Converged Networks	
CS 4476	Introduction to Computer Vision	
CS 4605	Mobile and Ubiquitous Computing	
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [5]		3
Free Electives [3,7]		**11**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005

Courses that are cross-listed with ECE must be taken under the ECE number.

[1] Student must complete one Ethics course during their program. For a complete list of Ethics courses, please see the Ethics Catalog page.

[2] Minimum grade of C required

[3] The following courses are not allowed: HPS 1XXX, PHYS 2XXX (AP Credit), ECE 3710, ECE 3741, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113. Maximum of six credit hours of Special Problems or research may be applied toward the degree

[4] CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (Must be taken on Letter/Grade basis)

[5] Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

[6] No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE/CS 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[7] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (5)

[8] ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

[9] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Computer Engineering - Distributed System & Software Design and Information Internetworks

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		

Choose one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Choose one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
CS 1331	Introduction to Object Oriented Programming [2]	3
CS 1332	Data Structures and Algorithms for Applications [2]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [2]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [2]	2
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Ethics [1]		
Probability/Statistics [4,9]		3
Major Requirements		
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
ECE 2040	Circuit Analysis [2]	3
ECE 3058	Architecture, Systems, Concurrency, and Energy in Computation [2]	4
Distributed System & Software Design [2,6,9]		
CS 3251	Computer Networking I	3
Select three of the following (Advanced Software): [2,6]		9
CS 4220	Programming Embedded Systems	
ECE 4122	Advanced Programming Techniques for Engineering Applications	
ECE 4795	GPU Programming for Video Games	
ECE 4150	Cloud Computing	
ECE 4180	Embedded Systems Design	
CS 4605	Mobile and Ubiquitous Computing	
CS 3651	Prototyping Intelligent Devices	
Information Internetworks [2,6,9]		
CS 2340	Objects and Design	3
CS 3510	Design and Analysis of Algorithms	3
or CS 3511	Design and Analysis of Algorithms, Honors	
Select two of the following (Introduction to Information Management): [2,6]		6
CS 3251	Computer Networking I	
CS 4235	Introduction to Information Security	
CS 4400	Introduction to Database Systems	
Select one of the following (Advanced Information Management): [2,6]		3
CS 4237	Computer and Network Security	
CS 4251	Computer Networking II	
CS 4255	Introduction to Network Management	
CS 4261	Mobile Applications and Services for Converged Networks	
CS 4270	Data Communications Laboratory	
CS 4365	Introduction to Enterprise Computing	
CS 4420	Database System Implementation	
CS 4440	Emerging Database Technologies and Applications	
CS 4675	Internet Computing Systems, Services and Applications	
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [5]		3
Free Electives [3,7]		**12**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005

Courses that are cross-listed with ECE must be taken under the ECE number.

1 Student must complete one Ethics course during their program. For a complete list of Ethics courses, please see the Ethics Catalog page.

2 Minimum grade of C required

3 The following courses are not allowed: HPS 1XXX, PHYS 2XXX (AP Credit), ECE 3710, ECE 3741, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113. Maximum of six credit hours of Special Problems or research may be applied toward the degree

4 CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (Must be taken on Letter/Grade basis)

5 Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

6 No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE/CS 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).

2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[7] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (5)

[8] ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

[9] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Computer Engineering - Distributed System & Software Design and Robotics & Autonomous Systems

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Choose one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Choose one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
CS 1331	Introduction to Object Oriented Programming [2]	3
CS 1332	Data Structures and Algorithms for Applications [2]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [2]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [2]	2
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Ethics [1]		
Probability/Statistics [4,9]		3
Major Requirements		
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
ECE 2040	Circuit Analysis [2]	3
ECE 3058	Architecture, Systems, Concurrency, and Energy in Computation [2]	4
Distributed System & Software Design [2,6,9]		
CS 3251	Computer Networking I	3
Select three of the following (Advanced Software): [2,6]		9
CS 4220	Programming Embedded Systems	
ECE 4122	Advanced Programming Techniques for Engineering Applications	
ECE 4795	GPU Programming for Video Games	
ECE 4150	Cloud Computing	
ECE 4180	Embedded Systems Design	
CS 4605	Mobile and Ubiquitous Computing	
CS 3651	Prototyping Intelligent Devices	
Robotics & Autonomous Systems [2,6,9]		
ECE 2026	Introduction to Signal Processing	3
ECE 3550	Feedback Control Systems	3
ECE 4550	Control System Design	4
Select one of the following (Robotics & Autonomous Systems Topics): [2,6]		3
ECE 3084	Signals and Systems	
ECE 4560	Introduction to Automation and Robotics	
ECE 4570	System Theory for Communication and Control	

ECE 4580	Computational Computer Vision	
Robotics & Autonomous Systems Electives		
ECE 3000/4000-level Elective [8]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [5]		3
Free Electives [3,7]		**11**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005

Courses that are cross-listed with ECE must be taken under the ECE number.

[1] Student must complete one Ethics course during their program. For a complete list of Ethics courses, please see the Ethics Catalog page.

[2] Minimum grade of C required

[3] The following courses are not allowed: HPS 1XXX, PHYS 2XXX (AP Credit), ECE 3710, ECE 3741, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113. Maximum of six credit hours of Special Problems or research may be applied toward the degree

[4] CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (Must be taken on Letter/Grade basis)

[5] Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

[6] No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE/CS 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[7] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (5)

[8] ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

[9] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Computer Engineering - Distributed System & Software Design and Signal & Information Processing

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Choose one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Choose one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
CS 1331	Introduction to Object Oriented Programming [2]	3
CS 1332	Data Structures and Algorithms for Applications [2]	3

CS 2050	Introduction to Discrete Mathematics for Computer Science [2]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [2]	2
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Ethics [1]		
Probability/Statistics [4,9]		3
Major Requirements		
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
ECE 2040	Circuit Analysis [2]	3
ECE 3058	Architecture, Systems, Concurrency, and Energy in Computation [2]	4
Distributed System & Software Design [2,6,9]		
CS 3251	Computer Networking I	3
Select three of the following (Advanced Software): [2,6]		9
CS 4220	Programming Embedded Systems	
ECE 4122	Advanced Programming Techniques for Engineering Applications	
ECE 4795	GPU Programming for Video Games	
ECE 4150	Cloud Computing	
ECE 4180	Embedded Systems Design	
CS 4605	Mobile and Ubiquitous Computing	
CS 3651	Prototyping Intelligent Devices	
Signal & Information Processing [2,6,9]		
ECE 2026	Introduction to Signal Processing	3
Select one of the following (Signal & Information Processing Topics): [2,6]		3
ECE 3251	Optimization for Information Systems	
ECE 4270	Fundamentals of Digital Signal Processing	
Select two of the following: [2,6]		6
ECE 3084	Signals and Systems	
ECE 3251	Optimization for Information Systems	
ECE 4122	Advanced Programming Techniques for Engineering Applications	
ECE 4180	Embedded Systems Design	
ECE 4260	Random Signals and Applications	
ECE 4270	Fundamentals of Digital Signal Processing	
ECE 4271	Applications of Digital Signal Processing	
ECE 4273	Design Synthesis of Application-specific Signal Processors	
ECE 4783	Introduction to Medical Image Processing	
Signal & Information Processing Electives		
ECE 3000/4000-level Elective [8]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [5]		3
Free Electives [3,7]		**12**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005

Courses that are cross-listed with ECE must be taken under the ECE number.

[1] Student must complete one Ethics course during their program. For a complete list of Ethics courses, please see the Ethics Catalog page.

[2] Minimum grade of C required

[3] The following courses are not allowed: HPS 1XXX, PHYS 2XXX (AP Credit), ECE 3710, ECE 3741, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113. Maximum of six credit hours of Special Problems or research may be applied toward the degree

[4] CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (Must be taken on Letter/Grade basis)

[5] Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

[6] No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE/CS 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[7] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (5)

[8] ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

[9] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Computer Engineering - Distributed System & Software Design and Systems & Architecture

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Choose one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Choose one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
CS 1331	Introduction to Object Oriented Programming [2]	3
CS 1332	Data Structures and Algorithms for Applications [2]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [2]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [2]	2
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Ethics [1]		
Probability/Statistics [4,9]		3
Major Requirements		
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
ECE 2040	Circuit Analysis [2]	3
ECE 3058	Architecture, Systems, Concurrency, and Energy in Computation [2]	4
Distributed System & Software Design [2,6,9]		
CS 3251	Computer Networking I	3
Select three of the following (Advanced Software): [2,6]		9
CS 4220	Programming Embedded Systems	
ECE 4122	Advanced Programming Techniques for Engineering Applications	
ECE 4795	GPU Programming for Video Games	
ECE 4150	Cloud Computing	
ECE 4180	Embedded Systems Design	
CS 4605	Mobile and Ubiquitous Computing	
CS 3651	Prototyping Intelligent Devices	
Systems & Architecture [2,6,9]		
CS 2340	Objects and Design	3
CS 3210	Design of Operating Systems	3
CS 3220	Computer Structures: Hardware/Software Codesign of a Processor	3
CS 3510	Design and Analysis of Algorithms	3
or CS 3511	Design and Analysis of Algorithms, Honors	
Select one of the following (Software Tools): [2,6]		3
CS 3300	Introduction to Software Engineering	
CS 4240	Compilers, Interpreters, and Program Analyzers	
Select one of the following (Advanced Systems & Architecture): [2,6]		3
CS 4210	Advanced Operating Systems	
CS 4220	Programming Embedded Systems	
ECE 4100	Advanced Computer Architecture	
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [5]		3
Free Electives [3,7]		**9**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005

Courses that are cross-listed with ECE must be taken under the ECE number.

1. Student must complete one Ethics course during their program. For a complete list of Ethics courses, please see the Ethics Catalog page.
2. Minimum grade of C required
3. The following courses are not allowed: HPS 1XXX, PHYS 2XXX (AP Credit), ECE 3710, ECE 3741, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113. Maximum of six credit hours of Special Problems or research may be applied toward the degree

[4] CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (Must be taken on Letter/Grade basis)

[5] Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

[6] No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE/CS 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[7] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (5)

[8] ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

[9] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Computer Engineering - Distributed System & Software Design and Telecommunications

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Choose one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Choose one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
CS 1331	Introduction to Object Oriented Programming [2]	3
CS 1332	Data Structures and Algorithms for Applications [2]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [2]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [2]	2
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Ethics [1]		
Probability/Statistics [4,9]		3
Major Requirements		
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
ECE 2040	Circuit Analysis [2]	3
ECE 3058	Architecture, Systems, Concurrency, and Energy in Computation [2]	4
Distributed System & Software Design [2,6,9]		
CS 3251	Computer Networking I	3
Select three of the following (Advanced Software): [2,6]		9

CS 4220	Programming Embedded Systems	
ECE 4122	Advanced Programming Techniques for Engineering Applications	
ECE 4795	GPU Programming for Video Games	
ECE 4150	Cloud Computing	
ECE 4180	Embedded Systems Design	
CS 4605	Mobile and Ubiquitous Computing	
CS 3651	Prototyping Intelligent Devices	
Telecommunications [2,6,9]		
ECE 2026	Introduction to Signal Processing	3
Select one of the following: [2,6]		3
ECE 3600	Computer Communications	
CS 3251	Computer Networking I	
Select one of the following: [2,6]		3
ECE 4601	Communication Systems	
ECE 4606	Wireless Communications	
Select one of the following: [2,6]		3
ECE 3084	Signals and Systems	
ECE 4350	Electromagnetic and Microwave Applications	
ECE 4370	Antenna Engineering	
ECE 4500	Optical Engineering	
ECE 4601	Communication Systems	
ECE 4605	Topics in Networks	
ECE 4606	Wireless Communications	
ECE 4607	Mobile and Wireless Networks	
Telecommunications Electives		
ECE 3000/4000-level Elective [8]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [5]		3
Free Electives [3,7]		**12**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005

Courses that are cross-listed with ECE must be taken under the ECE number.

[1] Student must complete one Ethics course during their program. For a complete list of Ethics courses, please see the Ethics Catalog page.

[2] Minimum grade of C required

[3] The following courses are not allowed: HPS 1XXX, PHYS 2XXX (AP Credit), ECE 3710, ECE 3741, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113. Maximum of six credit hours of Special Problems or research may be applied toward the degree

[4] CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (Must be taken on Letter/Grade basis)

[5] Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

[6] No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE/CS 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[7] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (5)

[8] ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

[9] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

BACHELOR OF SCIENCE IN COMPUTER SCIENCE

Bachelor of Science in Computer Science with Threads

Focus: building on a base of fundamentals in programming and computational theory to provide a solid foundation of knowledge and skills for applying digital processes effectively to issues of broad interest in a global society.

The undergraduate degree in computer science (CS) offered by the College of Computing provides a solid foundation of knowledge and skills for applying digital processes effectively to issues of broad interest in a global society. Our program is based on a unique concept, Threads™ , a significant College of Computing innovation in undergraduate CS education. The curriculum builds on a base of fundamentals in programming and computational theory to allow each student the opportunity to explore a variety of computing paths in depth. There are eight Threads, each providing a focused journey through a broad spectrum of course offerings at Georgia Tech in preparation for a distinctive future in a changing and interconnected world. Each student selects two Threads to fulfill the requirements for an accredited Bachelor of Science degree in computer science. It is at the intersection of the two paths that the unique synergistic value of this educational experience is realized. Graduates will leave the College of Computing fully aware of the limitless potential of their dynamic discipline and be able to adapt and continuously add value to society throughout their careers.

The Threads™ represent partial paths through the curriculum. Thus, a student weaves a degree from these Threads. Students are not forced to make Thread decisions very early in their academic careers; however, they may if they want. We define the Threads so they are flexible enough to allow for a variety of technical and creative experiences. Threads are coherent enough that students develop computing skills even if their focus shifts as they go along.

The CS curriculum also offers opportunities in undergraduate research and international study. In addition to the standard four-year plan, a five-year cooperative plan is offered for students who wish to combine their academic education with industry experience.

The undergraduate program requires:

- a total of 124 credit hours for graduation, plus
- a two-hour Wellness course.
- With the exception of free electives, all Bachelor of Science degree coursework must be taken on a letter-grade basis.
- Up to six hours of free electives may be taken on a pass/fail basis.
- No 1000- or 2000-level HPS hours or precalculus hours (currently MATH 1113) may be used as free electives.
- No course that covers the same material as other courses in a student's plan of study can be used as a free elective.
- All required CS courses, whether Thread or non-Thread, must be completed with a C or better to be counted toward degree requirements.
- All courses listed as required for a Thread, whether CS or non-CS, must be completed with a C or better to be counted toward degree requirements.

The College of Computing Defines Eight Threads

A Thread provides an intuitive, flexible, and mutually strengthening set of courses that allows a student to craft a distinctive future in an area that is certain to have societal value in the emerging world. A Thread provides a skill and credential basis that allows graduates to create value in ways beyond what would be possible with only a narrowly focused tool set.

Choose any two threads to create your own path and special variation on an area of study.

1. Computing and Devices: creating devices embedded in physical objects that interact in the physical world
2. Computing and Information Internetworks: representing, transforming, transmitting, and presenting information
3. Computing and Intelligence: building top-to-bottom models of human-level intelligence
4. Computing and Media: building systems in order to exploit computing's abilities to provide creative outlets
5. Computing and Modeling - Simulation: representing natural and physical processes
6. Computing and People: designing, building, and evaluating systems that treat the human as a central component
7. Computing and Systems and Architecture : creating computer architectures, systems, and languages
8. Computing and Theory: theoretical foundations underlying a wide range of computing disciplines

Threads™ are defined as partial paths through the course offerings of the Institute. Students constructs their own personalized computer science degree by weaving through two Threads™. Each Thread™ is about 2/3 of a degree, but with Thread™ arithmetic, since there's so much overlap, 2/3 + 2/3 = 1. Each pair of Threads™ fulfills the requirements for an accredited Bachelor of Science degree in computer science.

The Power of One Thread

Are you a computationalist who is interested in the expressive arts (telling stories, making games, creating emotional experiences)? Join the Computing and Media Thread. Here you'll see courses on topics ranging from computational graphics to Hamlet, from human perception to interactive fiction engines.

Are you a computationalist who is interested in placing intelligence in physical objects like robots, airplanes, or cell phones? Join the Computing and Devices Thread. Here you'll see courses on everything from computational sensors to dealing with noisy data, from real-time operating systems to mobile power issues and computational autonomy.

Weaving Two Threads Together - A Leap

Are you interested in computer security? Then perhaps choose Computing and Information to learn how data is stored, retrieved, encoded, transmitted, etc. And perhaps also choose Computing and People to learn how people use technology, how to run experiments with human subjects, etc. The kind of person you will become is the kind of person who will be able to invent and build secure systems that are usable by people.

For more information about the BS CS undergraduate program or the College of Computing, visit The College of Computing website.

Bachelor of Science in Computer Science Threads

Devices

The Devices thread is concerned with embedded computational artifacts that interact with people or the physical world. In this thread, one learns how to create and evaluate devices that operate under physical constraints such as size, power, and bandwidth. Examples include PDAs, cell phones, robots, jet engines, and intelligent appliances.

- Modeling and Simulation & Devices
- Theory & Devices
- Information Internetworks & Devices
- Intelligence & Devices
- Media & Devices
- People & Devices
- Systems and Architecture & Devices

Information Internetworks

The Information Internetworks thread is where computing meets the data enterprise and all that this implies. The thread prepares students for all levels of information management by helping them to capture, represent, organize, transform, communicate, and present data so that it becomes information.

- Modeling and Simulation & Information Internetworks
- Devices & Information Internetworks
- Theory & Information Internetworks
- Intelligence & Information Internetworks
- Media & Information Internetworks
- People & Information Internetworks
- Systems and Architecture & Information Internetworks

Intelligence

The Intelligence thread is where computing models intelligence. This thread is concerned with computational models of intelligence from top to bottom. To this end, we emphasize designing and implementing artifacts that exhibit various levels of intelligence as well as understanding and modeling natural cognitive agents such as humans, ants, or bees. Students acquire the technical knowledge and skills necessary for expressing, specifying, understanding, creating, and exploiting computational models that represent cognitive processes. It prepares students for fields as diverse as artificial intelligence, machine learning, perception, and cognitive science, as well as for fields that benefit from applications of techniques from those fields.

- Modeling and Simulation & Intelligence
- Devices & Intelligence
- Theory & Intelligence
- Information Internetworks & Intelligence
- Media & Intelligence
- People & Intelligence
- Systems and Architecture & Intelligence

Media

The Media thread is where computing meets design. This thread prepares students by helping them to understand the technical and computational capabilities of systems in order to exploit their abilities to provide creative outlets.

- Modeling and Simulation & Media
- Devices & Media
- Theory & Media
- Information Internetworks & Media
- Intelligence & Media
- People & Media
- Systems and Architecture & Media

Modeling and Simulation

The Modeling - Simulation thread is intended for students interested in developing a deep understanding and appreciation of how natural and human-generated systems such as weather, biological processes, supply chains, or computers can be represented by mathematical models and computer software. Such models are widely used today to better understand and predict the behavior of such systems. Because these models are often described and represented by mathematical expressions, and the models themselves often deal with physical phenomena, a background in mathematics and the sciences is required. Combining this background with a deep knowledge in computer science will yield the basic tools necessary to transform abstract conceptual models to computer programs that execute efficiently on digital machines. The required coursework in this thread includes topics in continuous and discrete mathematics, the sciences, and computing. Elective courses enable students to further develop and apply their knowledge and skills to a specific discipline where Modeling - Simulation plays an important role.

- Devices & Modeling and Simulation
- Theory & Modeling and Simulation
- Information Internetworks & Modeling and Simulation
- Intelligence & Modeling and Simulation
- Media & Modeling and Simulation
- People & Modeling and Simulation
- Systems and Architecture & Modeling and Simulation

People

The People thread is where computing meets users. This thread prepares students by helping them to understand the theoretical and computational foundations for designing, building, and evaluating systems that treat the human as a central component.

- Modeling and Simulation & People
- Devices & People
- Theory & People
- Information Internetworks & People
- Intelligence & People
- Media & People
- Systems and Architecture & People

Systems and Architecture

The Systems and Architecture thread is where many of the practical skills of computing are learned. Like Theory, Systems and Architecture lies at the center of computing. It prepares students to create and evaluate computer architectures, systems, and languages across a variety of paradigms and approaches.

- Modeling and Simulation & Systems and Architecture
- Devices & Systems and Architecture
- Theory & Systems and Architecture
- Information Internetworks & Systems and Architecture
- Intelligence & Systems and Architecture
- Media & Systems and Architecture
- People & Systems and Architecture

Theory

The Theory thread is where computing meets itself. Theory teaches students the theoretical and mathematical foundations underlying a wide range of computational disciplines. Early preparation includes discrete mathematics, algorithms, and complexity. Knowledge goals are for students to mature in development and analysis of abstract models for applications ranging from theoretical computer science to computational physics, biology, mathematics, economics, and optimization.

- Modeling and Simulation & Theory
- Devices & Theory
- Information Internetworks & Theory
- Intelligence & Theory
- Media & Theory
- People & Theory
- Systems and Architecture & Theory

Cooperative Programs

The College of Computing participates in the undergraduate and graduate Cooperative Programs. See links below for further Information:

- Undergraduate Cooperative Plan
- Graduate Cooperative Plan

International Plan

The College of Computing has an approved BS CS International Plan that accommodates the unique requirements of this option discussed in the International Plan section of the catalog.

However, due to the flexible nature of the Threads curriculum, the International Plan designation may not be available with all of the Thread combinations. Efforts will be made to work with interested students to accommodate their individual circumstances with regard to the International Plan designator for the Bachelor of Science in Computer Science.

Research Option

To complete the Research Option in the College of Computing, students must:

1. Complete at least nine units of undergraduate research
   a. Over at least two, preferably three terms
   b. Research may be for either pay or credit;
2. Write an undergraduate thesis/report of research on their findings;
3. Take
   a. LMC 4701: Undergraduate Research Proposal Writing (taken during the first or second semester of research)
   b. LMC 4702: Undergraduate Research Thesis Writing (taken during the thesis writing semester).

Research Classes

The following classes count toward fulfillment of the Research Option:

Research for Credit

Code	Title	Credit Hours
CS 2699	Undergraduate Research (Freshman and Sophomore)	1-12
CS 4699	Undergraduate Research (Junior and Senior)	1-12
CS 4980	Research Capstone Project	1-21

Research for Pay (Audit only)

Code	Title	Credit Hours
CS 2698	Undergraduate Research Assistantship (Freshman and Sophomore)	1-12
CS 4698	Undergraduate Research Assistantship (Junior and Senior)	1-12

To get credit toward completion of the Research Option for research for pay, students must be registered for the appropriate audit-only, research for pay class (CS 2698 or 4698). If work on research for pay begins after the close of registration and the student has not signed up for the appropriate class, unfortunately it is not possible to get credit toward the Research Option for work that term.

A research project will also fulfill the capstone design requirement if the student registers for CS 4980 for one of the research terms. This is typically done the last semester of research, while taking LMC 4702.

Completion of the Research Option is noted on the student's transcript. For more information, see www.urop.gatech.edu.

General Research Option Information

BS/MS in Computer Science

Students who want to pursue

the BS/MS option must apply to the MSCS program after completing at least 60 hours of work towards the BSCS degree. Applicants should have a cumulative GPA of at least 3.4. This GPA must be maintained for the student to take graduate level courses.

Students admitted to the program will take 6 hours during their final undergraduate year to double count in both their BSCS and MSCS degrees; they should choose 3 hours of MS Core or Elective hours their fall semester and 3 hours of MS Core or Elective hours their spring semester that can count toward their thread hours and CS Specialization hours.

Visit College of Computing for more information.

Bachelor of Science in Computer Science - Thread: Devices & Information Internetworks

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
Lab Science [2]		4
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [5]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
Lab Science [2]		4
CS 1100	Freshman Leap Seminar	1
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [5]	2
Major Requirements		
CS 2340	Objects and Design [1]	3
Select one for Professionalism/Ethics Requirement: [1]		3
CS 3001	Computing, Society, and Professionalism	
CS 4001	Computing, Society, and Professionalism	
CS 4002	Robots and Society	
CS 4003	AI, Ethics, and Society	
CS 4726	Privacy, Technology, Policy, and Law	
SLS 3110	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,4]		6
Concentration		
CS 2110	Computer Organization and Programming [1]	4
CS 2200	Computer Systems and Networks [1]	4
CS 3251	Computer Networking I [1]	3
CS 3510	Design and Analysis of Algorithms [1]	3
or CS 3511	Design and Analysis of Algorithms, Honors	
ECE 2031	Digital Design Laboratory [1]	2
Select one for Building Devices: [1]		4
CS 3651	Prototyping Intelligent Devices	
ECE 4180	Embedded Systems Design	
Select one for Devices in the Real World: [1,3]		3
CS 3630	Introduction to Perception and Robotics	
CS 4261	Mobile Applications and Services for Converged Networks	
CS 4605	Mobile and Ubiquitous Computing	
CS 4476	Introduction to Computer Vision	
Select one for Introduction to Information Management: [1]		3
CS 4235	Introduction to Information Security	
CS 4400	Introduction to Database Systems	
Select one of the following for Advanced Information Management: [1,3]		3
CS 4235	Introduction to Information Security (if not taken for Intro to Mgt requirement)	
CS 4251	Computer Networking II	
CS 4255	Introduction to Network Management	
CS 4261	Mobile Applications and Services for Converged Networks	
CS 4262	Network Security	
CS 4270	Data Communications Laboratory	
CS 4365	Introduction to Enterprise Computing	
CS 4400	Introduction to Database Systems (if not taken for Intro to Info Mgt requirement)	
CS 4420	Database System Implementation	
CS 4440	Emerging Database Technologies and Applications	
CS 4675	Internet Computing Systems, Services and Applications	
Select one of the following for Thread elective: [1]		3
CS 3220	Computer Structures: Hardware/Software Codesign of a Processor	
CS 3240	Languages and Computation	
CS 3600	Introduction to Artificial Intelligence	
CS 3630	Introduction to Perception and Robotics	
CS 3651	Prototyping Intelligent Devices	
CS 4210	Advanced Operating Systems	
CS 4220	Programming Embedded Systems	
CS 4235	Introduction to Information Security	
CS 4237	Computer and Network Security	
CS 4251	Computer Networking II	
CS 4255	Introduction to Network Management	

CS 4261	Mobile Applications and Services for Converged Networks	
CS 4270	Data Communications Laboratory	
CS 4365	Introduction to Enterprise Computing	
CS 4400	Introduction to Database Systems	
CS 4420	Database System Implementation	
CS 4440	Emerging Database Technologies and Applications	
CS 4470	Introduction to User Interface Software	
CS 4476	Introduction to Computer Vision	
CS 4605	Mobile and Ubiquitous Computing	
CS 4616	Pattern Recognition	
CS 4632	Advanced Intelligent Robotics	
CS 4641	Machine Learning	
CS 4649	Robot Intelli Planning	
CS 4675	Internet Computing Systems, Services and Applications	
CS 4685	Pervasive Systems and Networking	
ECE 4180	Embedded Systems Design	
Other Required Courses		
MATH 3012	Applied Combinatorics	3
Select one of the following:		3
MATH 3215	Introduction to Probability and Statistics	
MATH 3670	Probability and Statistics with Applications	
CEE 3770	Statistics and Applications	
ISYE 3770	Statistics and Applications	
ISYE 2027 & ISYE 2028	Probability with Applications and Basic Statistical Methods	
Free Electives		
Free Electives		13
Total Credit Hours		**126**

Pass-fail only allowed for Free Electives (max 6 credit hours) and CS 1100.

1 Minimum grade of C required.

2 Two of three labs MUST be a sequence.

3 If CS 4261 is successfully completed, an additional 3 credit hour Thread Elective is required. Thread Electives must be chosen from the following list: CS 3220, CS 3240 , CS 3600, CS 3630, CS 3651, CS 4210, CS 4220, CS 4235, CS 4237, CS 4251, CS 4255, CS 4270, CS 4365, CS 4400, CS 4420, CS 4440, CS 4470, CS 4495, CS 4605, CS 4616, CS 4632, CS 4641, CS 4649, CS 4675, CS 4685, or ECE 4180.

4 Junior Design Options are as follows (students must pick one option and may not change):

- Option 1 - LMC 3432, LMC 3431, CS 3311,CS 3312.
- Option 2 - ECE VIP courses and LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option.
- Option 4 - CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours), LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit. Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.

5 Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computer Science - Thread: Devices & Intelligence

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
Lab Science [2]		4
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [6]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
PSYC 1101	General Psychology	3
Any SS		6
Core F - Courses Related to Major		
Lab Science [2]		4
CS 1100	Freshman Leap Seminar	1
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [6]	2

Major Requirements		
CS 2340	Objects and Design [1]	3
Select one for Professionalism/Ethics requirement: [1]		3
CS 3001	Computing, Society, and Professionalism	
CS 4001	Computing, Society, and Professionalism	
CS 4002	Robots and Society	
CS 4003	AI, Ethics, and Society	
CS 4726	Privacy, Technology, Policy, and Law	
SLS 3110	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [5]		6
Concentration		
CS 2110	Computer Organization and Programming [1]	4
CS 2200	Computer Systems and Networks [1]	4
CS 3251	Computer Networking I [1]	3
CS 3510	Design and Analysis of Algorithms [1]	3
or CS 3511	Design and Analysis of Algorithms, Honors	
CS 3600	Introduction to Artificial Intelligence [1]	3
ECE 2031	Digital Design Laboratory [1]	2
Select one of the following for Building Devices: [1]		4
CS 3651	Prototyping Intelligent Devices	
ECE 4180	Embedded Systems Design	
Select one of the following for Devices in the Real World: [1,3,4]		3
CS 3630	Introduction to Perception and Robotics	
CS 4261	Mobile Applications and Services for Converged Networks	
CS 4605	Mobile and Ubiquitous Computing	
CS 4476	Introduction to Computer Vision	
Select one of the following for Embodied Intelligence: [1,3]		3
CS 3630	Introduction to Perception and Robotics	
CS 3790	Introduction to Cognitive Science	
PSYC 3040	Sensation and Perception	
Select three of the following for Approaches to Intelligence: [1,4]		9
CS 4476	Introduction to Computer Vision	
CS 4510	Automata and Complexity Theory	
CS 4635	Knowledge-Based Artificial Intelligence	
CS 4641	Machine Learning	
CS 4644	Deep Learning	
CS 4646	Machine Learning for Trading	
CS 4649	Robot Intelli Planning	
CS 4650	Natural Language Understanding	
CS 4731	Game AI	
Other Required Courses		
MATH 3012	Applied Combinatorics	3
Select one of the following:		3
MATH 3215	Introduction to Probability and Statistics	
MATH 3670	Probability and Statistics with Applications	
CEE 3770	Statistics and Applications	
ISYE 3770	Statistics and Applications	
or ISYE 2 & ISYE 2	Probability with Applications and Basic Statistical Methods	
Free Electives		
Free Electives		7
Total Credit Hours		**126**

Pass-fail only allowed for Free Electives (max 6 credit hours) and CS 1100.

1 Minimum grade of C required.

2 Two of three labs MUST be a sequence.

3 If CS 3630 is successfully completed, both requirements are fulfilled, and three credit hours are added to Free Electives.

4 If CS 4476 is successfully completed, Devices in the Real World is completed, one course from Approaches to Intelligence is considered fulfilled, and three credit hours are added to Free Electives.

5 Junior Design Options are as follows (students must pick one option and may not change):

- Option 1 - LMC 3432, LMC 3431, CS 3311,CS 3312.
- Option 2 - ECE VIP courses and LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option.
- Option 4 - CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours),LMC 3403 (3 hours) = 9 hours
- Option 5 - CS 4723 (3 hours), LMC 3403 (3 hours) = 6 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit.
Students using CREATE-X (option 4) for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours withLMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.

6 Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computer Science - Thread: Devices & Media

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		

PHYS 2211	Introductory Physics I [2]	4
Lab Science [2]		4
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [4]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
Lab Science [2]		4
CS 1100	Freshman Leap Seminar	1
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [4]	2
Major Requirements		
CS 2340	Objects and Design [1]	3
Select one for Professionalism/Ethics requirement: [1]		3
CS 3001	Computing, Society, and Professionalism	
CS 4001	Computing, Society, and Professionalism	
CS 4002	Robots and Society	
CS 4003	AI, Ethics, and Society	
CS 4726	Privacy, Technology, Policy, and Law	
SLS 3110	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,3]		6
Concentration		
CS 2110	Computer Organization and Programming [1]	4
CS 2200	Computer Systems and Networks [1]	4
CS 3251	Computer Networking I [1]	3
ECE 2031	Digital Design Laboratory [1]	2
Select one of the following for Building Devices: [1]		4
CS 3651	Prototyping Intelligent Devices	
ECE 4180	Embedded Systems Design	
Select one of the following for Devices in the Real World: [1]		3
CS 3630	Introduction to Perception and Robotics	
CS 4261	Mobile Applications and Services for Converged Networks	
CS 4605	Mobile and Ubiquitous Computing	
CS 4476	Introduction to Computer Vision	
Select one of the following for Algorithm Fundamentals: [1]		3
CS 3240	Languages and Computation	
CS 3510	Design and Analysis of Algorithms	
CS 3511	Design and Analysis of Algorithms, Honors	
Select three of the following for Media Technologies: [1]		9
CS 3451	Computer Graphics	
CS 4455	Video Game Design and Programming	
CS 4460	Introduction to Information Visualization	
CS 4464	Computational Journalism	
CS 4475	Computational Photography	
CS 4480	Digital Video Special Effects	
CS 4488	Procedural Content Generation	
CS 4496	Computer Animation	
CS 4497	Computational Aesthetics	
CS 4590	Principles and Applications of Computer Audio	
Other Required Courses		
MATH 3012	Applied Combinatorics	3
Select one of the following:		3
MATH 3215	Introduction to Probability and Statistics	
MATH 3670	Probability and Statistics with Applications	
CEE 3770	Statistics and Applications	
ISYE 3770	Statistics and Applications	
or ISYE 2 & ISYE 2	Probability with Applications and Basic Statistical Methods	
Free Electives		
Free Electives		13
Total Credit Hours		**126**

Pass-Fail only allowed for Free Electives (max six credit hours) and CS 1100.

1 Minimum grade of C required.

2 Two of three labs MUST be a sequence.

3 Junior Design Options are as follows (students must pick one option and may not change):

- Option 1 - LMC 3432, LMC 3431, CS 3311,CS 3312.
- Option 2 - ECE VIP courses and LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option
- Option 4 - CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours), LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit.
Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.

4 Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computer Science - Thread: Devices & People

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
Lab Science [2]		4
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [5]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
PSYC 1101	General Psychology	3
Any SS		6
Core F - Courses Related to Major		
Lab Science [2]		4
CS 1100	Freshman Leap Seminar	1
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [5]	2
Major Requirements		
CS 2340	Objects and Design [1]	3
Select one for Professionalism/Ethics requirement: [1]		3
CS 3001	Computing, Society, and Professionalism	
CS 4001	Computing, Society, and Professionalism	
CS 4002	Robots and Society	
CS 4003	AI, Ethics, and Society	
CS 4726	Privacy, Technology, Policy, and Law	
SLS 3110	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,4]		6
Concentration		
CS 2110	Computer Organization and Programming [1]	4
CS 2200	Computer Systems and Networks [1]	4
CS 3251	Computer Networking I [1]	3
ECE 2031	Digital Design Laboratory [1]	2
PSYC 2015	Research Methods [1]	4
Select one of the following for Building Devices: [1]		4
CS 3651	Prototyping Intelligent Devices	
ECE 4180	Embedded Systems Design	
Select one of the following for Devices in the Real World: [1,3]		3
CS 3630	Introduction to Perception and Robotics	
CS 4261	Mobile Applications and Services for Converged Networks	
CS 4605	Mobile and Ubiquitous Computing	
CS 4476	Introduction to Computer Vision	
Select one of the following for Algorithm Fundamentals: [1]		3
CS 3240	Languages and Computation	
CS 3510	Design and Analysis of Algorithms	
CS 3511	Design and Analysis of Algorithms, Honors	
Select one of the following for Social/Behavioral Science for Computing: [1]		3
PSYC 2210	Social Psychology	
PSYC 2760	Human Language Processing	
PSYC 3040	Sensation and Perception	
CS 3750	Human Computer Interface Design and Evaluation [1]	3
or CS 3751	Introduction to User Interface Design	
Select two of the following for Human-Centered Technology: [1,3]		6
CS 3790	Introduction to Cognitive Science	
CS 4660	Introduction to Educational Technology	
CS 4460	Introduction to Information Visualization	
CS 4470	Introduction to User Interface Software	
CS 4605	Mobile and Ubiquitous Computing	
CS 4472	Design of Online Communities	
CS 4745	Information and Communication Technologies and Global Development	
Other Required Courses		
MATH 3012	Applied Combinatorics	3
Select one of the following:		3
MATH 3215	Introduction to Probability and Statistics	
MATH 3670	Probability and Statistics with Applications	
CEE 3770	Statistics and Applications	
ISYE 3770	Statistics and Applications	
or ISYE 2 & ISYE 2	Probability with Applications and Basic Statistical Methods	
Free Electives		

Free Electives	6
Total Credit Hours	**126**

Pass-fail only allowed for Free Electives (max 6 credit hours) and CS 1100.

1 Minimum grade of C required.
2 Two of three labs MUST be a sequence.
3 If CS 4605 is successfully completed, both requirements are fulfilled, and three credits are added to Free Electives.
4 Junior Design Options are as follows (students must pick one option and may not change):
- Option 1 - LMC 3432, LMC 3431, CS 3311,CS 3312.
- Option 2 - ECE VIP courses and LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option.
- Option 4 - CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours), LMC 3403 (3 hours) = 9 hours.

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit.
Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.
5 Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computer Science - Thread: Devices & Systems and Architecture

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
Lab Science [2]		4
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [4]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces [5]	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
Lab Science [2]		4
CS 1100	Freshman Leap Seminar	1
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [4]	2
Major Requirements		
CS 2340	Objects and Design [1]	3
Select one for Professionalism/Ethics requirement: [1]		3
CS 3001	Computing, Society, and Professionalism	
CS 4001	Computing, Society, and Professionalism	
CS 4002	Robots and Society	
CS 4003	AI, Ethics, and Society	
CS 4726	Privacy, Technology, Policy, and Law	
SLS 3110	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,3]		6
Concentration		
CS 2110	Computer Organization and Programming [1]	4
CS 2200	Computer Systems and Networks [1]	4
CS 3210	Design of Operating Systems [1]	3
CS 3220	Computer Structures: Hardware/Software Codesign of a Processor [1]	3
CS 3251	Computer Networking I [1]	3
CS 3510	Design and Analysis of Algorithms [1]	3
or CS 3511	Design and Analysis of Algorithms, Honors	
ECE 2031	Digital Design Laboratory [1]	2
Select one of the following for Building Devices: [1]		4
CS 3651	Prototyping Intelligent Devices	
ECE 4180	Embedded Systems Design	
Select one of the following for Devices in the Real World: [1]		3
CS 3630	Introduction to Perception and Robotics	
CS 4261	Mobile Applications and Services for Converged Networks	
CS 4605	Mobile and Ubiquitous Computing	
CS 4476	Introduction to Computer Vision	
Select one of the following for Systems Software Tools: [1]		3

CS 3300	Introduction to Software Engineering	
CS 4240	Compilers, Interpreters, and Program Analyzers	
Select one of the following for Advanced Systems Architectures: [1]		3
CS 4210	Advanced Operating Systems	
CS 4220	Programming Embedded Systems	
CS 4290	Advanced Computer Organization	
Other Required Courses		
MATH 3012	Applied Combinatorics	3
Select one of the following:		3
MATH 3215	Introduction to Probability and Statistics	
MATH 3670	Probability and Statistics with Applications	
CEE 3770	Statistics and Applications	
ISYE 3770	Statistics and Applications	
or ISYE 2027 & ISYE 2028	Probability with Applications and Basic Statistical Methods	
Free Electives		
Free Electives		10
Total Credit Hours		**126**

Pass-fail only allowed for Free Electives (max 6 credit hours) and CS 1100.

[1] Minimum grade of C required.

[2] Two of three labs MUST be a sequence.

[3] Junior Design Options are as follows (students must pick one option and may not change):

- Option 1 - LMC 3432, LMC 3431, CS 3311,CS 3312.
- Option 2 - ECE VIP courses and LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option
- Option 4 - CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours), LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit.

Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.

[4] Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computer Science - Thread: Devices & Theory

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 1060	The Science of Physical Activity and Health	
or APPH 1070	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
Lab Science [2]		4
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [4]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
Lab Science [2]		4
CS 1100	Freshman Leap Seminar	1
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [4]	2
Major Requirements		
CS 2340	Objects and Design [1]	3
Select one for Ethics/Professionalism: [1]		3
CS 3001	Computing, Society, and Professionalism	
CS 4001	Computing, Society, and Professionalism	
CS 4002	Robots and Society	
CS 4003	AI, Ethics, and Society	
CS 4726	Privacy, Technology, Policy, and Law	
SLS 3110	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,3]		6
Concentration		
CS 2110	Computer Organization and Programming [1]	4
CS 2200	Computer Systems and Networks [1]	4
CS 3251	Computer Networking I [1]	3
CS 3510	Design and Analysis of Algorithms [1]	3
or CS 3511	Design and Analysis of Algorithms, Honors	

CS 4510	Automata and Complexity Theory [1]	3
CS 4540	Advanced Algorithms [1]	3
ECE 2031	Digital Design Laboratory [1]	2
Select one of the following for Building Devices: [1]		4
CS 3651	Prototyping Intelligent Devices	
ECE 4180	Embedded Systems Design	
MATH 3406	A Second Course in Linear Algebra [1]	3
Select one of the following for Devices in the Real World: [1]		3
CS 3630	Introduction to Perception and Robotics	
CS 4261	Mobile Applications and Services for Converged Networks	
CS 4605	Mobile and Ubiquitous Computing	
CS 4476	Introduction to Computer Vision	
Select one of the following for Advanced Mathematics: [1]		3
MATH 4022	Introduction to Graph Theory	
MATH 4150	Introduction to Number Theory	
MATH 4032	Combinatorial Analysis	
Other Required Courses		
MATH 3012	Applied Combinatorics	3
Select one of the following:		3
MATH 3215	Introduction to Probability and Statistics	
MATH 3670	Probability and Statistics with Applications	
CEE 3770	Statistics and Applications	
ISYE 3770	Statistics and Applications	
or ISYE 2027 & ISYE 2028	Probability with Applications and Basic Statistical Methods	
Free Electives		
Free Electives		10
Total Credit Hours		**126**

Pass-fail only allowed for Free Electives (max 6 credit hours) and CS 1100.

1 Minimum grade of C required.
2 Two of three labs MUST be a sequence.
3 Junior Design Options are as follows (students must pick one option and may not change):

- Option 1 - LMC 3432, LMC 3431, CS 3311,CS 3312.
- Option 2 - ECE VIP courses and LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option.
- Option 4- CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours), LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit.
Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.

4 Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computer Science - Thread: Information Internetworks & Intelligence

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
Lab Science [2]		4
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [4]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
PSYC 1101	General Psychology	3
Any SS		6
Core F - Courses Related to Major		
Lab Science [2]		4
CS 1100	Freshman Leap Seminar	1
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [4]	2
Major Requirements		
CS 2340	Objects and Design [1]	3
Select one for Professionalism/Ethics requirement: [1]		3
CS 3001	Computing, Society, and Professionalism	

CS 4001	Computing, Society, and Professionalism	
CS 4002	Robots and Society	
CS 4003	AI, Ethics, and Society	
CS 4726	Privacy, Technology, Policy, and Law	
SLS 3110	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,3]		6
Concentration		
CS 2110	Computer Organization and Programming [1]	4
CS 2200	Computer Systems and Networks [1]	4
CS 3510	Design and Analysis of Algorithms [1]	3
or CS 3511	Design and Analysis of Algorithms, Honors	
CS 3600	Introduction to Artificial Intelligence [1]	3
Select six credit hours of the following for Introduction to Information Management: [1]		6
CS 3251	Computer Networking I	
CS 4235	Introduction to Information Security	
CS 4400	Introduction to Database Systems	
Select one of the following for Advanced Information Management: [1]		3
CS 3251	Computer Networking I (if not taken for Introduction to Information Management)	
CS 4235	Introduction to Information Security (if not taken for Introduction to Information Management)	
CS 4251	Computer Networking II	
CS 4255	Introduction to Network Management	
CS 4261	Mobile Applications and Services for Converged Networks	
CS 4262	Network Security	
CS 4270	Data Communications Laboratory	
CS 4365	Introduction to Enterprise Computing	
CS 4400	Introduction to Database Systems (if not taken for Introduction to Information Management)	
CS 4420	Database System Implementation	
CS 4440	Emerging Database Technologies and Applications	
CS 4675	Internet Computing Systems, Services and Applications	
Select three of the following for Approaches to Intelligence: [1]		9
CS 4476	Introduction to Computer Vision	
CS 4510	Automata and Complexity Theory	
CS 4635	Knowledge-Based Artificial Intelligence	
CS 4641	Machine Learning	
CS 4644	Deep Learning	
CS 4646	Machine Learning for Trading	
CS 4649	Robot Intelli Planning	
CS 4650	Natural Language Understanding	
CS 4731	Game AI	
Select one of the following for Embodied Intelligence: [1]		3
CS 3630	Introduction to Perception and Robotics	
CS 3790	Introduction to Cognitive Science	
PSYC 3040	Sensation and Perception	
Other Required Courses		
MATH 3012	Applied Combinatorics	3
Select one of the following:		3
MATH 3215	Introduction to Probability and Statistics	
MATH 3670	Probability and Statistics with Applications	
CEE 3770	Statistics and Applications	
ISYE 3770	Statistics and Applications	
or ISYE 2027 & ISYE 2028	Probability with Applications and Basic Statistical Methods	
Free Electives		
Free Electives		10
Total Credit Hours		**126**

Pass-fail only allowed for Free Electives (max six credit hours) and CS 1100.

1 Minimum grade of C required.
2 Two of three labs MUST be a sequence.
3 Junior Design Options are as follows (students must pick one option and may not change):
- Option 1 - LMC 3432, LMC 3431, CS 3311,CS 3312.
- Option 2 - ECE VIP courses and LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option.
- Option 4 - CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours), LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit.
Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.
4 Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computer Science - Thread: Information Internetworks & Media

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 1070	The Science of Physical Activity and Health	
or APPH 1080	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		

CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
Lab Science [2]		4
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [4]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
Lab Science [2]		4
CS 1100	Freshman Leap Seminar	1
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [4]	2
Major Requirements		
CS 2340	Objects and Design [1]	3
Select one for Professionalism/Ethics requirement: [1]		3
CS 3001	Computing, Society, and Professionalism	
CS 4001	Computing, Society, and Professionalism	
CS 4002	Robots and Society	
CS 4003	AI, Ethics, and Society	
CS 4726	Privacy, Technology, Policy, and Law	
SLS 3110	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,3]		6
Concentration		
CS 2110	Computer Organization and Programming [1]	4
CS 2200	Computer Systems and Networks [1]	4
CS 3510	Design and Analysis of Algorithms [1]	3
or CS 3511	Design and Analysis of Algorithms, Honors	
Select six credit hours of the following for Introduction to Information Management: [1]		6
CS 3251	Computer Networking I	
CS 4235	Introduction to Information Security	
CS 4400	Introduction to Database Systems	
Select one of the following for Advanced Information Management: [1]		3
CS 3251	Computer Networking I (if not taken for Introduction to Information Management)	
CS 4235	Introduction to Information Security (if not taken for Introduction to Information Management)	
CS 4251	Computer Networking II	
CS 4255	Introduction to Network Management	
CS 4261	Mobile Applications and Services for Converged Networks	
CS 4262	Network Security	
CS 4270	Data Communications Laboratory	
CS 4365	Introduction to Enterprise Computing	
CS 4400	Introduction to Database Systems (if not taken for Introduction for Information Management)	
CS 4420	Database System Implementation	
CS 4440	Emerging Database Technologies and Applications	
CS 4675	Internet Computing Systems, Services and Applications	
Select three of the following for Media Technologies: [1]		9
CS 3451	Computer Graphics	
CS 4455	Video Game Design and Programming	
CS 4460	Introduction to Information Visualization	
CS 4464	Computational Journalism	
CS 4475	Computational Photography	
CS 4480	Digital Video Special Effects	
CS 4488	Procedural Content Generation	
CS 4496	Computer Animation	
CS 4497	Computational Aesthetics	
CS 4590	Principles and Applications of Computer Audio	
Other Required Courses		
MATH 3012	Applied Combinatorics	3
Select one of the following:		3
MATH 3215	Introduction to Probability and Statistics	
MATH 3670	Probability and Statistics with Applications	
CEE 3770	Statistics and Applications	
ISYE 3770	Statistics and Applications	
or ISYE 2 & ISYE 2	Probability with Applications and Basic Statistical Methods	
Free Electives		
Free Electives		16
Total Credit Hours		**126**

Pass-fail only allowed for Free Electives (max six credit hours),CS 1100 (if required) .

1 Minimum grade of C required.
2 Two of three labs MUST be a sequence.
3 Junior Design Options are as follows (students must pick one option and may not change):
- Option 1 - LMC 3432, LMC 3431, CS 3311,CS 3312.
- Option 2 - ECE VIP courses and LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option.

- Option 4- CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours), LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit.
Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.

[4] Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computer Science - Thread: Information Internetworks & People

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
Lab Science [2]		4
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [4]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
PSYC 1101	General Psychology	3
Any SS		6
Core F - Courses Related to Major		
Lab Science [2]		4
CS 1100	Freshman Leap Seminar	1
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [4]	2
Major Requirements		
CS 2340	Objects and Design [1]	3
Select one for Professionalism/Ethics requirement: [1]		3
CS 3001	Computing, Society, and Professionalism	
CS 4001	Computing, Society, and Professionalism	
CS 4002	Robots and Society	
CS 4003	AI, Ethics, and Society	
CS 4726	Privacy, Technology, Policy, and Law	
SLS 3110	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,3]		6
Concentration		
CS 2110	Computer Organization and Programming [1]	4
CS 2200	Computer Systems and Networks [1]	4
CS 3510	Design and Analysis of Algorithms [1]	3
or CS 3511	Design and Analysis of Algorithms, Honors	
PSYC 2015	Research Methods [1]	4
Select six credit hours of the following for Introduction to Information Management: [1]		6
CS 3251	Computer Networking I	
CS 4235	Introduction to Information Security	
CS 4400	Introduction to Database Systems	
Select one of the following for Advanced Information Management: [1]		3
CS 3251	Computer Networking I (if not taken for Intro to Information Management)	
CS 4235	Introduction to Information Security (if not taken for Intro to Information Management)	
CS 4251	Computer Networking II	
CS 4255	Introduction to Network Management	
CS 4261	Mobile Applications and Services for Converged Networks	
CS 4262	Network Security	
CS 4270	Data Communications Laboratory	
CS 4365	Introduction to Enterprise Computing	
CS 4400	Introduction to Database Systems (if not taken for Intro to Information Management)	
CS 4420	Database System Implementation	
CS 4440	Emerging Database Technologies and Applications	
CS 4675	Internet Computing Systems, Services and Applications	
CS 3750	Human Computer Interface Design and Evaluation [1]	3

or CS 3751	Introduction to User Interface Design	
Select six credit hours of the following for Human-Centered Technology: [1]		6
CS 3790	Introduction to Cognitive Science	
CS 4460	Introduction to Information Visualization	
CS 4660	Introduction to Educational Technology	
CS 4470	Introduction to User Interface Software	
CS 4605	Mobile and Ubiquitous Computing	
CS 4472	Design of Online Communities	
CS 4745	Information and Communication Technologies and Global Development	
Select one of the following for Social/Behavioral Science for Computing: [1]		3
PSYC 2210	Social Psychology	
PSYC 2760	Human Language Processing	
PSYC 3040	Sensation and Perception	
Other Required Courses		
MATH 3012	Applied Combinatorics	3
Select one of the following:		3
MATH 3215	Introduction to Probability and Statistics	
MATH 3670	Probability and Statistics with Applications	
CEE 3770	Statistics and Applications	
ISYE 3770	Statistics and Applications	
or ISYE 2 & ISYE 2	Probability with Applications and Basic Statistical Methods	
Free Electives		
Free Electives		9
Total Credit Hours		**126**

Pass-fail only allowed for Free Electives (max six credit hours) and CS 1100.

1 Minimum grade of C required.
2 Two of three labs MUST be a sequence.
3 Junior Design Options are as follows (students must pick one option and may not change):
- Option 1 - LMC 3432, LMC 3431, CS 3311,CS 3312.
- Option 2 - ECE VIP courses and LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option.
- Option 4- CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours), LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit.
Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.
4 Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computer Science - Thread: Information Internetworks & Systems and Architecture

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
Lab Science [2]		4
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [4]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
Lab Science [2]		4
CS 1100	Freshman Leap Seminar	1
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [4]	2
Major Requirements		
CS 2340	Objects and Design [1]	3
Select one for Professionalism/Ethics requirement: [1]		3
CS 3001	Computing, Society, and Professionalism	
CS 4001	Computing, Society, and Professionalism	
CS 4002	Robots and Society	
CS 4003	AI, Ethics, and Society	

CS 4726	Privacy, Technology, Policy, and Law	
SLS 3110	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,3]		6
Concentration		
CS 2110	Computer Organization and Programming [1]	4
CS 2200	Computer Systems and Networks [1]	4
CS 3210	Design of Operating Systems [1]	3
CS 3220	Computer Structures: Hardware/Software Codesign of a Processor [1]	3
CS 3510	Design and Analysis of Algorithms [1]	3
or CS 3511	Design and Analysis of Algorithms, Honors	
ECE 2031	Digital Design Laboratory [1]	2
Select six credit hours of the following for Introduction to Information Management: [1]		6
CS 3251	Computer Networking I	
CS 4235	Introduction to Information Security	
CS 4400	Introduction to Database Systems	
Select one of the following for Advanced Information Management: [1]		3
CS 3251	Computer Networking I (if not takeng for Introduction to Information Management)	
CS 4235	Introduction to Information Security (if not taken for Introduction to Information Management)	
CS 4251	Computer Networking II	
CS 4255	Introduction to Network Management	
CS 4261	Mobile Applications and Services for Converged Networks	
CS 4262	Network Security	
CS 4270	Data Communications Laboratory	
CS 4365	Introduction to Enterprise Computing	
CS 4400	Introduction to Database Systems (if not taken for Introduction to Information Management)	
CS 4420	Database System Implementation	
CS 4440	Emerging Database Technologies and Applications	
CS 4675	Internet Computing Systems, Services and Applications	
Select one of the following for Systems Software Tools: [1]		3
CS 3300	Introduction to Software Engineering	
CS 4240	Compilers, Interpreters, and Program Analyzers	
Select one of the following for Advanced Systems Architectures: [1]		3
CS 4210	Advanced Operating Systems	
CS 4220	Programming Embedded Systems	
CS 4290	Advanced Computer Organization	
Other Required Courses		
MATH 3012	Applied Combinatorics	3
Select one of the following:		3
MATH 3215	Introduction to Probability and Statistics	
MATH 3670	Probability and Statistics with Applications	
CEE 3770	Statistics and Applications	
ISYE 3770	Statistics and Applications	
or ISYE 2027	Probability with Applications	
& ISYE 2028	and Basic Statistical Methods	
Free Electives		
Free Electives		11
Total Credit Hours		**126**

Pass-fail only allowed for Free Electives (max six credit hours) and CS 1100.

1 Minimum grade of C required.

2 Two of three labs MUST be a sequence.

3 Junior Design Options are as follows (students must pick one option and may not change):

- Option 1 - LMC 3432, LMC 3431, CS 3311,CS 3312.
- Option 2 - ECE VIP courses and LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option.
- Option 4- CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours), LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit.
Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.

4 Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computer Science - Thread: Intelligence & Media

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
or CS 1315	Introduction to Media Computation	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4

Lab Science [2]		4
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [4]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
PSYC 1101	General Psychology	3
Any SS		6
Core F - Courses Related to Major		
Lab Science [2]		4
CS 1100	Freshman Leap Seminar	1
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [4]	2
Major Requirements		
CS 2340	Objects and Design [1]	3
Select one for the Professionalism/Ethics requirement: [1]		3
CS 3001	Computing, Society, and Professionalism	
CS 4001	Computing, Society, and Professionalism	
CS 4002	Robots and Society	
CS 4003	AI, Ethics, and Society	
CS 4726	Privacy, Technology, Policy, and Law	
SLS 3110	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,3]		6
Concentration		
CS 2110	Computer Organization and Programming [1]	4
CS 3510	Design and Analysis of Algorithms [1]	3
or CS 3511	Design and Analysis of Algorithms, Honors	
CS 3600	Introduction to Artificial Intelligence [1]	3
Select one of the following for Embodied Intelligence: [1]		3
CS 3630	Introduction to Perception and Robotics	
CS 3790	Introduction to Cognitive Science	
PSYC 3040	Sensation and Perception	
Select three of the following for Approaches to Intelligence: [1]		9
CS 4510	Automata and Complexity Theory	
CS 4635	Knowledge-Based Artificial Intelligence	
CS 4476	Introduction to Computer Vision	
CS 4641	Machine Learning	
CS 4644	Deep Learning	
CS 4646	Machine Learning for Trading	
CS 4649	Robot Intelli Planning	
CS 4650	Natural Language Understanding	
CS 4731	Game AI	
Select three of the following for Media Technologies: [1]		9
CS 3451	Computer Graphics	
CS 4455	Video Game Design and Programming	
CS 4460	Introduction to Information Visualization	
CS 4464	Computational Journalism	
CS 4475	Computational Photography	
CS 4480	Digital Video Special Effects	
CS 4488	Procedural Content Generation	
CS 4496	Computer Animation	
CS 4497	Computational Aesthetics	
CS 4590	Principles and Applications of Computer Audio	
Other Required Courses		
MATH 3012	Applied Combinatorics	3
Select one of the following:		3
MATH 3215	Introduction to Probability and Statistics	
MATH 3670	Probability and Statistics with Applications	
CEE 3770	Statistics and Applications	
ISYE 3770	Statistics and Applications	
or ISYE 2 & ISYE 2	Probability with Applications and Basic Statistical Methods	
Free Electives		
Free Electives		14
Total Credit Hours		**126**

Pass-fail only allowed for Free Electives (max 6 credit hours) and CS 1100..

1 Minimum grade of C required.

2 Two of three lab sciences MUST be a sequence.

3 Junior Design Options are as follows (students must pick one option and may not change):

- Option 1 - LMC 3432, LMC 3431, CS 3311,CS 3312.
- Option 2 - ECE VIP courses and LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option.
- Option 4- CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours), LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit.
Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.

4 Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computer Science - Thread: Intelligence & People

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
Lab Science [2]		4
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [6]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
PSYC 1101	General Psychology	3
Any SS		6
Core F - Courses Related to Major		
Lab Science [2]		4
CS 1100	Freshman Leap Seminar	1
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [6]	2
Major Requirements		
CS 2340	Objects and Design [1]	3
Select one for Professionalism/Ethics requirement: [1]		3
CS 3001	Computing, Society, and Professionalism	
CS 4001	Computing, Society, and Professionalism	
CS 4002	Robots and Society	
CS 4003	AI, Ethics, and Society	
CS 4726	Privacy, Technology, Policy, and Law	
SLS 3110	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,5]		6
Concentration		
CS 2110	Computer Organization and Programming [1]	4
CS 3510	Design and Analysis of Algorithms [1]	3
or CS 3511	Design and Analysis of Algorithms, Honors	
CS 3600	Introduction to Artificial Intelligence [1]	3
PSYC 2015	Research Methods [1]	4
Select one of the following for Embodied Intelligence: [1,3,4]		3
CS 3630	Introduction to Perception and Robotics	
CS 3790	Introduction to Cognitive Science	
PSYC 3040	Sensation and Perception	
Select three of the following for Approaches to Intelligence: [1]		9
CS 4635	Knowledge-Based Artificial Intelligence	
CS 4476	Introduction to Computer Vision	
CS 4510	Automata and Complexity Theory	
CS 4641	Machine Learning	
CS 4644	Deep Learning	
CS 4646	Machine Learning for Trading	
CS 4649	Robot Intelli Planning	
CS 4650	Natural Language Understanding	
CS 4731	Game AI	
CS 3750	Human Computer Interface Design and Evaluation [1]	3
or CS 3751	Introduction to User Interface Design	
Select six credit hours of the following for Human-Centered Technology: [1,3]		6
CS 3790	Introduction to Cognitive Science	
CS 4660	Introduction to Educational Technology	
CS 4460	Introduction to Information Visualization	
CS 4470	Introduction to User Interface Software	
CS 4472	Design of Online Communities	
CS 4605	Mobile and Ubiquitous Computing	
CS 4745	Information and Communication Technologies and Global Development	
Select one of the following for Social/Behavioral Science for Computing: [1,4]		3
PSYC 2210	Social Psychology	
PSYC 2760	Human Language Processing	
PSYC 3040	Sensation and Perception	
Other Required Courses		
MATH 3012	Applied Combinatorics	3
Select one of the following:		3
MATH 3215	Introduction to Probability and Statistics	
MATH 3670	Probability and Statistics with Applications	
CEE 3770	Statistics and Applications	
ISYE 3770	Statistics and Applications	
or ISYE 2027 & ISYE 2028	Probability with Applications and Basic Statistical Methods	
Free Electives		

Free Electives [3,4]		7
Total Credit Hours		**126**

Pass-fail only allowed for Free Electives (max 6 credit hours) and CS 1100.

1 Minimum grade of C required.
2 Two of three lab sciences MUST be a sequence.
3 If CS 3790 is successfully completed, Embodied Intelligence is completed, one course from Human-Centered Technology is considered fulfilled, and three credit hours are added to Free Electives.
4 If PSYC 3040 is successfully completed, both requirements are fulfilled, and three credit hours are added to Free Electives.
5 Junior Design Options are as follows (students must pick one option and may not change):
- Option 1 - LMC 3432, LMC 3431, CS 3311,CS 3312.
- Option 2 - ECE VIP courses and LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option.
- Option 4- CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours), LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit.
Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.
6 Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computer Science - Thread: Intelligence & Systems and Architecture

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
Lab Science [2]		4
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [4]	4
or MATH 155	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
PSYC 1101	General Psychology	3
Any SS		6
Core F - Courses Related to Major		
Lab Science [2]		4
CS 1100	Freshman Leap Seminar	1
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [4]	2
Major Requirements		
CS 2340	Objects and Design [1]	3
Select one for Professionalism/Ethics requirement: [1]		3
CS 3001	Computing, Society, and Professionalism	
CS 4001	Computing, Society, and Professionalism	
CS 4002	Robots and Society	
CS 4003	AI, Ethics, and Society	
CS 4726	Privacy, Technology, Policy, and Law	
SLS 3110	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,3]		6
Concentration		
CS 2110	Computer Organization and Programming [1]	4
CS 2200	Computer Systems and Networks [1]	4
CS 3210	Design of Operating Systems [1]	3
CS 3220	Computer Structures: Hardware/Software Codesign of a Processor [1]	3
CS 3510	Design and Analysis of Algorithms [1]	3
or CS 3511	Design and Analysis of Algorithms, Honors	
ECE 2031	Digital Design Laboratory [1]	2
CS 3600	Introduction to Artificial Intelligence [1]	3
Select one of the following for Embodied Intelligence: [1]		3
CS 3630	Introduction to Perception and Robotics	
CS 3790	Introduction to Cognitive Science	
PSYC 3040	Sensation and Perception	
Select three of the following for Approaches to Intelligence: [1]		9
CS 4635	Knowledge-Based Artificial Intelligence	

CS 4476	Introduction to Computer Vision	
CS 4510	Automata and Complexity Theory	
CS 4641	Machine Learning	
CS 4644	Deep Learning	
CS 4646	Machine Learning for Trading	
CS 4649	Robot Intelli Planning	
CS 4650	Natural Language Understanding	
CS 4731	Game AI	
Select one of the following for Advanced System Architectures: [1]		3
CS 3300	Introduction to Software Engineering	
CS 4240	Compilers, Interpreters, and Program Analyzers	
Select one of the following for Systems Software Tools: [1]		3
CS 4210	Advanced Operating Systems	
CS 4220	Programming Embedded Systems	
CS 4290	Advanced Computer Organization	
Other Required Courses		
MATH 3012	Applied Combinatorics	3
Select one of the following:		3
MATH 3215	Introduction to Probability and Statistics	
MATH 3670	Probability and Statistics with Applications	
CEE 3770	Statistics and Applications	
ISYE 3770	Statistics and Applications	
or ISYE 2 & ISYE 2	Probability with Applications and Basic Statistical Methods	
Free Electives		
Free Electives		5
Total Credit Hours		**126**

Pass-fail only allowed for Free Electives (max 6 credit hours) and CS 1100.

1 Minimum grade of C required.
2 Two of three lab sciences MUST be a sequence.
3 Junior Design Options are as follows (students must pick one option and may not change):

- Option 1 - LMC 3432, LMC 3431, CS 3311,CS 3312.
- Option 2 - ECE VIP courses and LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option.
- Option 4- CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours), LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit.
Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.
4 Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computer Science - Thread: Media & People

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
Lab Science [2]		4
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [5]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
PSYC 1101	General Psychology	3
Any SS		6
Core F - Courses Related to Major		
Lab Science [2]		4
CS 1100	Freshman Leap Seminar	1
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [5]	2
Major Requirements		
CS 2340	Objects and Design [1]	3
Select one for the Professionalism/Ethics requirement: [1]		3
CS 3001	Computing, Society, and Professionalism	
CS 4001	Computing, Society, and Professionalism	
CS 4002	Robots and Society	
CS 4003	AI, Ethics, and Society	
CS 4726	Privacy, Technology, Policy, and Law	

SLS 3110	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,4]		6
Concentration		
Select one of the following for Media Architectures: [1]		4
CS 2110	Computer Organization and Programming	
CS 2261	Media Device Architectures	
PSYC 2015	Research Methods [1]	4
Select three of the following for Media Technologies: [1,3]		9
CS 3451	Computer Graphics	
CS 4455	Video Game Design and Programming	
CS 4460	Introduction to Information Visualization	
CS 4464	Computational Journalism	
CS 4475	Computational Photography	
CS 4480	Digital Video Special Effects	
CS 4488	Procedural Content Generation	
CS 4496	Computer Animation	
CS 4497	Computational Aesthetics	
CS 4590	Principles and Applications of Computer Audio	
CS 3750	Human Computer Interface Design and Evaluation [1]	3
or CS 3751	Introduction to User Interface Design	
Select six credit hours of the following for Human-Centered Technology: [1,3]		6
CS 3790	Introduction to Cognitive Science	
CS 4660	Introduction to Educational Technology	
CS 4460	Introduction to Information Visualization	
CS 4470	Introduction to User Interface Software	
CS 4472	Design of Online Communities	
CS 4605	Mobile and Ubiquitous Computing	
CS 4745	Information and Communication Technologies and Global Development	
Select one of the following for Social/Behavioral Science for Computing: [1]		3
PSYC 2210	Social Psychology	
PSYC 2760	Human Language Processing	
PSYC 3040	Sensation and Perception	
Other Required Courses		
MATH 3012	Applied Combinatorics	3
Select one of the following:		3
MATH 3215	Introduction to Probability and Statistics	
MATH 3670	Probability and Statistics with Applications	
CEE 3770	Statistics and Applications	
ISYE 3770	Statistics and Applications	
or ISYE 2 & ISYE 2	Probability with Applications and Basic Statistical Methods	
Free Electives		
Free Electives		16
Total Credit Hours		**126**

Pass-fail only allowed for Free Electives (max six credit hours) and CS 1100.

[1] Minimum grade of C required.

[2] Two of three lab sciences MUST be a sequence.

[3] If CS 4460 is successfully completed, one of the Media Technologies is fulfilled, one of the Human-Centered Technology is fulfilled, and an additional 3 credit hour Thread Elective is required. Thread Electives can be chosen from the following courses: CS 2110, CS 2261, CS 3240, CS 3510, CS 3790, CS 4455, CS 4464, CS 4470, CS 4472, CS 4475, CS 4480, CS 4496, CS 4550, CS 4590, CS 4605, CS 4660, CS 4665, CS 4670, CS 4690, CS 4770, CS 4745, CS 4793, PSYC 2020, PSYC 2210, PSYC 2760, PSYC 3012, PSYC 3040, PSYC 4090, PSYC 4260 or CX 4236.

[4] Junior Design Options are as follows (students must pick one option and may not change):

- Option 1 - LMC 3432, LMC 3431, CS 3311,CS 3312.
- Option 2 - ECE VIP courses and LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option.
- Option 4- CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours), LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit.
Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.

[5] Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computer Science - Thread: Media & Systems and Architecture

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
Lab Science [2]		4

MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [4]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
Lab Science [2]		4
CS 1100	Freshman Leap Seminar	1
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [4]	2
Major Requirements		
CS 2340	Objects and Design [1]	3
Select one for the Professionalism/Ethics requirement: [1]		3
CS 3001	Computing, Society, and Professionalism	
CS 4001	Computing, Society, and Professionalism	
CS 4002	Robots and Society	
CS 4003	AI, Ethics, and Society	
CS 4726	Privacy, Technology, Policy, and Law	
SLS 3110	Technology and Sustainable Community Development	
Junior Design Options (Capston)		
Junior Design Option [1,3]		6
Concentration		
CS 2110	Computer Organization and Programming [1]	4
CS 2200	Computer Systems and Networks [1]	4
CS 3210	Design of Operating Systems [1]	3
CS 3220	Computer Structures: Hardware/Software Codesign of a Processor [1]	3
ECE 2031	Digital Design Laboratory [1]	2
CS 3510	Design and Analysis of Algorithms [1]	3
or CS 3511	Design and Analysis of Algorithms, Honors	
Select three of the following for Media Technologies: [1]		9
CS 3451	Computer Graphics	
CS 4455	Video Game Design and Programming	
CS 4460	Introduction to Information Visualization	
CS 4464	Computational Journalism	
CS 4475	Computational Photography	
CS 4480	Digital Video Special Effects	
CS 4488	Procedural Content Generation	
CS 4496	Computer Animation	
CS 4497	Computational Aesthetics	
CS 4590	Principles and Applications of Computer Audio	
Select one of the following for Advanced Systems Architectures: [1]		3
CS 4210	Advanced Operating Systems	
CS 4220	Programming Embedded Systems	
CS 4290	Advanced Computer Organization	
Select one of the following for Systems Software Tools: [1]		3
CS 3300	Introduction to Software Engineering	
CS 4240	Compilers, Interpreters, and Program Analyzers	
Other Required Courses		
MATH 3012	Applied Combinatorics	3
Select one of the following:		3
MATH 3215	Introduction to Probability and Statistics	
MATH 3670	Probability and Statistics with Applications	
CEE 3770	Statistics and Applications	
ISYE 3770	Statistics and Applications	
or ISYE 2027 & ISYE 2028	Probability with Applications and Basic Statistical Methods	
Free Electives		
Free Electives		11
Total Credit Hours		**126**

Pass-fail only allowed for Free Electives (max six credit hours) and CS 1100.

1 Minimum grade of C required.

2 Two of three lab sciences MUST be a sequence.

3 Junior Design Options are as follows (students must pick one option and may not change):

- Option 1 - LMC 3432, LMC 3431, CS 3311,CS 3312.
- Option 2 - ECE VIP courses and LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option.
- Option 4- CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours), LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit.
Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.

4 Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computer Science - Thread: Modeling-Simulation & Devices

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
Lab Science [2]		4
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [4]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
Lab Science [2]		4
CS 1100	Freshman Leap Seminar	1
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [4]	2
Major Requirements		
CS 2340	Objects and Design [1]	3
Select one for Ethics/Professionalism: [1]		3
CS 3001	Computing, Society, and Professionalism	
CS 4001	Computing, Society, and Professionalism	
CS 4002	Robots and Society	
CS 4003	AI, Ethics, and Society	
CS 4726	Privacy, Technology, Policy, and Law	
SLS 3110	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,3]		6
Concentration		
CS 2110	Computer Organization and Programming [1]	4
CS 2200	Computer Systems and Networks [1]	4
CS 3251	Computer Networking I [1]	3
CS 3510	Design and Analysis of Algorithms [1]	3
or CS 3511	Design and Analysis of Algorithms, Honors	
ECE 2031	Digital Design Laboratory [1]	2
MATH 2552	Differential Equations [1]	4
Select one of the following for Building Devices: [1]		4
CS 3651	Prototyping Intelligent Devices	
ECE 4180	Embedded Systems Design	
Select one of the following for Devices in the Real World: [1]		3
CS 3630	Introduction to Perception and Robotics	
CS 4261	Mobile Applications and Services for Converged Networks	
CS 4605	Mobile and Ubiquitous Computing	
CS 4476	Introduction to Computer Vision	
Select two of the following for Computational Science and Engineering: [1]		6
CS 4641	Machine Learning	
CX 4140	Computational Modeling Algorithms	
CX 4220	Introduction to High Performance Computing	
CX 4230	Computer Simulation	
CX 4640	Numerical Analysis I	
Other Required Courses		
MATH 3012	Applied Combinatorics	3
Select one of the following:		3
MATH 3215	Introduction to Probability and Statistics	
MATH 3670	Probability and Statistics with Applications	
CEE 3770	Statistics and Applications	
ISYE 3770	Statistics and Applications	
or ISYE 2027	Probability with Applications	
& ISYE 2028	and Basic Statistical Methods	
Free Electives		
Free Electives		12
Total Credit Hours		**126**

Pass-fail only allowed for Free Electives (max 6 credit hours) and CS 1100.

1. Minimum grade of C required.
2. Two of three labs MUST be a sequence.
3. Junior Design Options are as follows (students must pick one option and may not change):
   - Option 1 - LMC 3432, LMC 3431, CS 3311,CS 3312.
   - Option 2 - ECE VIP courses and LMC 3403.
   - Option 3 - Satisfy Georgia Tech Research Option
   - Option 4- CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours), LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit.

Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.

[4] Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computer Science - Thread: Modeling-Simulation & Intelligence

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
Lab Science [2]		4
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [5]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
PSYC 1101	General Psychology	3
Any SS		6
Core F - Courses Related to Major		
Lab Science [2]		4
CS 1100	Freshman Leap Seminar	1
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [5]	2
Major Requirements		
CS 2340	Objects and Design [1]	3
Select one for Profesionalism/Ethics requirement: [1]		3
CS 3001	Computing, Society, and Professionalism	
CS 4001	Computing, Society, and Professionalism	
CS 4002	Robots and Society	
CS 4003	AI, Ethics, and Society	
CS 4726	Privacy, Technology, Policy, and Law	
SLS 3110	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,4]		6
Concentration		
CS 2110	Computer Organization and Programming [1]	4
CS 2200	Computer Systems and Networks [1]	4
CS 3510	Design and Analysis of Algorithms [1]	3
or CS 3511	Design and Analysis of Algorithms, Honors	
CS 3600	Introduction to Artificial Intelligence [1]	3
MATH 2552	Differential Equations [1]	4
Select one of the following for Embodied Intelligence: [1]		3
CS 3630	Introduction to Perception and Robotics	
CS 3790	Introduction to Cognitive Science	
PSYC 3040	Sensation and Perception	
Select three of the following for Approaches to Intelligence: [1,3]		9
CS 4635	Knowledge-Based Artificial Intelligence	
CS 4476	Introduction to Computer Vision	
CS 4510	Automata and Complexity Theory	
CS 4641	Machine Learning	
CS 4644	Deep Learning	
CS 4646	Machine Learning for Trading	
CS 4649	Robot Intelli Planning	
CS 4650	Natural Language Understanding	
CS 4731	Game AI	
Select six credit hours of the following for Computational Science and Engineering: [1,3]		6
CS 4641	Machine Learning	
CX 4140	Computational Modeling Algorithms	
CX 4220	Introduction to High Performance Computing	
CX 4230	Computer Simulation	
CX 4640	Numerical Analysis I	
Other Required Courses		
MATH 3012	Applied Combinatorics	3
Select one of the following:		3
MATH 3215	Introduction to Probability and Statistics	
MATH 3670	Probability and Statistics with Applications	
CEE 3770	Statistics and Applications	
ISYE 3770	Statistics and Applications	

or ISYE 2027	Probability with Applications	
& ISYE 2028	and Basic Statistical Methods	
Free Electives		
Free Electives [3]		9
Total Credit Hours		**126**

Pass-fail only allowed for Free Electives (max 6 credit hours) and CS 1100.

1 Minimum grade of C required.
2 Two of three lab sciences MUST be a sequence.
3 If CS 4641 is successfully completed, it counts toward both requirements, and an addition 3 credit hours Free Elective is required.
4 Junior Design Options are as follows (students must pick one option and may not change):

- Option 1 - LMC 3432, LMC 3431, CS 3311,CS 3312.
- Option 2 - ECE VIP courses and LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option.
- Option 4- CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours), LMC 3403 (3 hours) = 9 hours
- Option 5 - CS 4723 (3 hours), LMC 3403 (3 hours) = 6 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit.
Students using CREATE-X (option 4) for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.
5 Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computer Science - Thread: Modeling-Simulation & People

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
Core B - Institutional Options		
MATH 1552	Integral Calculus	4
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
Lab Science [2]		4
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [4]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Choose one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
PSYC 1101	General Psychology	3
Any SS		6
Core F - Courses Related to Major		
Lab Science [2]		4
CS 1100	Freshman Leap Seminar	1
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [4]	2
Major Requirements		
CS 2340	Objects and Design [1]	3
Select one for Professionalism/Ethics requirements: [1]		3
CS 3001	Computing, Society, and Professionalism	
CS 4001	Computing, Society, and Professionalism	
CS 4002	Robots and Society	
CS 4003	AI, Ethics, and Society	
CS 4726	Privacy, Technology, Policy, and Law	
SLS 3110	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,3]		6
Concentration		
CS 2110	Computer Organization and Programming [1]	4
CS 2200	Computer Systems and Networks [1]	4
CS 3510	Design and Analysis of Algorithms [1]	3
or CS 3511	Design and Analysis of Algorithms, Honors	
MATH 2552	Differential Equations [1]	4
PSYC 2015	Research Methods [1]	4
CS 3750	Human Computer Interface Design and Evaluation [1]	3
or CS 3751	Introduction to User Interface Design	
Select two of the following for Computational Science and Engineering: [1]		6
CS 4641	Machine Learning	
CX 4140	Computational Modeling Algorithms	
CX 4220	Introduction to High Performance Computing	

CX 4230	Computer Simulation	
CX 4640	Numerical Analysis I	
Select two of the following for Human-Centered Technology: [1]		6
CS 3790	Introduction to Cognitive Science	
CS 4660	Introduction to Educational Technology	
CS 4460	Introduction to Information Visualization	
CS 4470	Introduction to User Interface Software	
CS 4472	Design of Online Communities	
CS 4605	Mobile and Ubiquitous Computing	
CS 4745	Information and Communication Technologies and Global Development	
Select one of the following for Social/Behavioral Science for Computing: [1]		3
PSYC 2210	Social Psychology	
PSYC 2760	Human Language Processing	
PSYC 3040	Sensation and Perception	
Other Required Courses		
MATH 3012	Applied Combinatorics	3
Choose one of the following:		3
MATH 3215	Introduction to Probability and Statistics	
MATH 3670	Probability and Statistics with Applications	
CEE 3770	Statistics and Applications	
ISYE 3770	Statistics and Applications	
or ISYE 2027 & ISYE 2028	Probability with Applications and Basic Statistical Methods	
Free Electives		
Free Electives		8
Total Credit Hours		**126**

Pass-fail only allowed for Free Electives (max 6 credit hours) and CS 1100.

[1] Minimum grade of C required.
[2] Two of three lab sciences MUST be a sequence.
[3] Junior Design Options are as follows (students must pick one option and may not change):

- Option 1 - LMC 3432, LMC 3431, CS 3311,CS 3312.
- Option 2 - ECE VIP courses and LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option.
- Option 4- CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours), LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit.
Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.
[4] Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computer Science - Thread: Modeling - Simulation & Systems and Architecture

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
Lab Science [2]		4
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [4]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Choose one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
Lab Science [2]		4
CS 1100	Freshman Leap Seminar	1
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [4]	2
Major Requirements		
CS 2340	Objects and Design [1]	3
Select one for Professionalism/Ethics requirement: [1]		3
CS 3001	Computing, Society, and Professionalism	
CS 4001	Computing, Society, and Professionalism	
CS 4002	Robots and Society	
CS 4003	AI, Ethics, and Society	

CS 4726	Privacy, Technology, Policy, and Law	
SLS 3110	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,3]		6
Concentration		
CS 2110	Computer Organization and Programming [1]	4
CS 2200	Computer Systems and Networks [1]	4
CS 3210	Design of Operating Systems [1]	3
CS 3220	Computer Structures: Hardware/Software Codesign of a Processor [1]	3
CS 3510	Design and Analysis of Algorithms [1]	3
or CS 3511	Design and Analysis of Algorithms, Honors	
ECE 2031	Digital Design Laboratory [1]	2
MATH 2552	Differential Equations [1]	4
Select two of the following for Computational Science and Engineering: [1]		6
CS 4641	Machine Learning	
CX 4140	Computational Modeling Algorithms	
CX 4220	Introduction to High Performance Computing	
CX 4230	Computer Simulation	
CX 4640	Numerical Analysis I	
Select one of the following for Software Systems Tools: [1]		3
CS 3300	Introduction to Software Engineering	
CS 4240	Compilers, Interpreters, and Program Analyzers	
Select one of the following for Advanced Systems Architectures: [1]		3
CS 4210	Advanced Operating Systems	
CS 4220	Programming Embedded Systems	
CS 4290	Advanced Computer Organization	
Other Required Courses		
MATH 3012	Applied Combinatorics	3
Select one of the following:		3
MATH 3215	Introduction to Probability and Statistics	
MATH 3670	Probability and Statistics with Applications	
CEE 3770	Statistics and Applications	
ISYE 3770	Statistics and Applications	
or ISYE 2 & ISYE 2	Probability with Applications and Basic Statistical Methods	
Free Electives		
Free Electives		10
Total Credit Hours		**126**

Pass-fail only allowed for Free Electives (max 6 credit hours) and CS 1100.

1 Minimum grade of C required.
2 Two of three lab sciences MUST be a sequence.
3 Junior Design Options are as follows (students must pick one option and may not change):
- Option 1 - LMC 3432, LMC 3431, CS 3311,CS 3312.
- Option 2 - ECE VIP courses and LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option.
- Option 4- CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours), LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit.
Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.
4 Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computer Science - Thread: Modeling-Simulation & Theory

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
Lab Science [2]		4
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [4]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
Lab Science [2]		4
CS 1100	Freshman Leap Seminar	1

CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [4]	2
Major Requirements		
CS 2340	Objects and Design [1]	3
Select one for Professionalism/Ethics requirement: [1]		3
CS 3001	Computing, Society, and Professionalism	
CS 4001	Computing, Society, and Professionalism	
CS 4002	Robots and Society	
CS 4003	AI, Ethics, and Society	
CS 4726	Privacy, Technology, Policy, and Law	
SLS 3110	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,3]		6
Concentration		
CS 2110	Computer Organization and Programming [1]	4
CS 2200	Computer Systems and Networks [1]	4
CS 3510	Design and Analysis of Algorithms [1]	3
or CS 3511	Design and Analysis of Algorithms, Honors	
CS 4510	Automata and Complexity Theory [1]	3
CS 4540	Advanced Algorithms [1]	3
MATH 2552	Differential Equations [1]	4
MATH 3406	A Second Course in Linear Algebra [1]	3
Select two of the following for Computational Science and Engineering: [1]		6
CS 4641	Machine Learning	
CX 4140	Computational Modeling Algorithms	
CX 4220	Introduction to High Performance Computing	
CX 4230	Computer Simulation	
CX 4640	Numerical Analysis I	
Select one of the following for Advanced Mathematics: [1]		3
MATH 4022	Introduction to Graph Theory	
MATH 4032	Combinatorial Analysis	
MATH 4150	Introduction to Number Theory	
Other Required Courses		
MATH 3012	Applied Combinatorics	3
Select one of the following:		3
MATH 3215	Introduction to Probability and Statistics	
MATH 3670	Probability and Statistics with Applications	
CEE 3770	Statistics and Applications	
ISYE 3770	Statistics and Applications	
or ISYE 2027 & ISYE 2028	Probability with Applications and Basic Statistical Methods	
Free Electives		
Free Electives		12
Total Credit Hours		**126**

Pass-fail only allowed for Free Electives (max 6 hours) and CS 1100.

1 Minimum grade of C required.

2 Two of three lab sciences MUST be a sequence.

3 Junior Design Options are as follows (students must pick one option and may not change):

- Option 1 - LMC 3432, LMC 3431, CS 3311,CS 3312.
- Option 2 - ECE VIP courses and LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option.
- Option 4- CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours), LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit.

Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.

4 Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computer Science - Thread: Modeling and Simulation & Media

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
Lab Science [2]		4
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [4]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	

INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
Lab Science [2]		4
CS 1100	Freshman Leap Seminar	1
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [4]	2
Major Requirements		
CS 2340	Objects and Design [1]	3
Select one for Professionalism/Ethics requirement: [1]		3
CS 3001	Computing, Society, and Professionalism	
CS 4001	Computing, Society, and Professionalism	
CS 4002	Robots and Society	
CS 4003	AI, Ethics, and Society	
CS 4726	Privacy, Technology, Policy, and Law	
SLS 3110	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,3]		6
Concentration		
CS 2110	Computer Organization and Programming [1]	4
CS 2200	Computer Systems and Networks [1]	4
CS 3510	Design and Analysis of Algorithms [1]	3
or CS 3511	Design and Analysis of Algorithms, Honors	
MATH 2552	Differential Equations [1]	4
Select three of the following for Media Technologies: [1]		9
CS 3451	Computer Graphics	
CS 4455	Video Game Design and Programming	
CS 4460	Introduction to Information Visualization	
CS 4464	Computational Journalism	
CS 4475	Computational Photography	
CS 4480	Digital Video Special Effects	
CS 4488	Procedural Content Generation	
CS 4496	Computer Animation	
CS 4497	Computational Aesthetics	
CS 4590	Principles and Applications of Computer Audio	
Select six credit hours of the following for Computational Science and Engineering: [1]		6
CS 4641	Machine Learning	
CX 4140	Computational Modeling Algorithms	
CX 4220	Introduction to High Performance Computing	
CX 4230	Computer Simulation	
CX 4640	Numerical Analysis I	
Other Required Courses		
MATH 3012	Applied Combinatorics	3
Select one of the following:		3
MATH 3215	Introduction to Probability and Statistics	
MATH 3670	Probability and Statistics with Applications	
CEE 3770	Statistics and Applications	
ISYE 3770	Statistics and Applications	
or ISYE 2 & ISYE 2	Probability with Applications and Basic Statistical Methods	
Free Electives		
Free Electives		15
Total Credit Hours		**126**

Pass-Fail only allowed for Free Electives (max six credit hours) and CS 1100.

1 Minimum grade of C required.

2 Two of three lab sciences MUST be a sequence.

3 Junior Design Options are as follows (students must pick one option and may not change):

- Option 1 - LMC 3432, LMC 3431, CS 3311,CS 3312.
- Option 2 - ECE VIP courses and LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option.
- Option 4- CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours), LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit.
Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.

4 Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computer Science - Thread: Modeling-Simulation & Information Internetworks

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4

Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
Lab Science [2]		4
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [4]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
Lab Science [2]		4
CS 1100	Freshman Leap Seminar	1
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [4]	2
Major Requirements		
CS 2340	Objects and Design [1]	3
Select one for Professionalism/Ethics requirement: [1]		3
CS 3001	Computing, Society, and Professionalism	
CS 4001	Computing, Society, and Professionalism	
CS 4002	Robots and Society	
CS 4003	AI, Ethics, and Society	
CS 4726	Privacy, Technology, Policy, and Law	
SLS 3110	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,3]		6
Concentration		
CS 2110	Computer Organization and Programming [1]	4
CS 2200	Computer Systems and Networks [1]	4
CS 3510	Design and Analysis of Algorithms [1]	3
or CS 3511	Design and Analysis of Algorithms, Honors	
MATH 2552	Differential Equations [1]	4
Select six credit hours of the following for Introduction to Information Management: [1]		6
CS 3251	Computer Networking I	
CS 4235	Introduction to Information Security	
CS 4400	Introduction to Database Systems	
Select one of the following for Advanced Information Management: [1]		3
CS 3251	Computer Networking I (if not taken for Introduction to Information Management)	
CS 4235	Introduction to Information Security (if not taken for Introduction to Information Management)	
CS 4251	Computer Networking II	
CS 4255	Introduction to Network Management	
CS 4261	Mobile Applications and Services for Converged Networks	
CS 4262	Network Security	
CS 4270	Data Communications Laboratory	
CS 4365	Introduction to Enterprise Computing	
CS 4400	Introduction to Database Systems (if not taken for Introduction to Information Management)	
CS 4420	Database System Implementation	
CS 4440	Emerging Database Technologies and Applications	
CS 4675	Internet Computing Systems, Services and Applications	
Select six credit hours of the following for Computational Science and Engineering: [1]		6
CS 4641	Machine Learning	
CX 4140	Computational Modeling Algorithms	
CX 4220	Introduction to High Performance Computing	
CX 4230	Computer Simulation	
CX 4640	Numerical Analysis I	
Other Required Courses		
MATH 3012	Applied Combinatorics	3
Select one of the following:		3
MATH 3215	Introduction to Probability and Statistics	
MATH 3670	Probability and Statistics with Applications	
CEE 3770	Statistics and Applications	
ISYE 3770	Statistics and Applications	
or ISYE 2 & ISYE 2	Probability with Applications and Basic Statistical Methods	
Free Electives		
Free Electives		15
Total Credit Hours		**126**

Pass-fail only allowed for Free Electives (max six credit hours) and CS 1100.

[1] Minimum grade of C required.
[2] Two of three labs MUST be a sequence.
[3] Junior Design Options are as follows (students must pick one option and may not change):

- Option 1 - LMC 3432, LMC 3431, CS 3311,CS 3312.
- Option 2 - ECE VIP courses and LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option.
- Option 4 - CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours), LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit.

Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.

[4] Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computer Science - Thread: People & Systems and Architecture

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
Lab Science [2]		4
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [4]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		6
PSYC 1101	General Psychology	3
Core F - Courses Related to Major		
Lab Science [2]		4
CS 1100	Freshman Leap Seminar	1
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [4]	2
Major Requirements		
CS 2340	Objects and Design [1]	3
Select one for Ethics/Professionalism: [1]		3
CS 3001	Computing, Society, and Professionalism	
CS 4001	Computing, Society, and Professionalism [1]	
CS 4002	Robots and Society	
CS 4003	AI, Ethics, and Society	
CS 4726	Privacy, Technology, Policy, and Law	
SLS 3110	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,3]		6
Concentration		
CS 2110	Computer Organization and Programming [1]	4
CS 2200	Computer Systems and Networks [1]	4
CS 3210	Design of Operating Systems [1]	3
CS 3220	Computer Structures: Hardware/Software Codesign of a Processor [1]	3
CS 3510	Design and Analysis of Algorithms [1]	3
or CS 3511	Design and Analysis of Algorithms, Honors	
ECE 2031	Digital Design Laboratory [1]	2
PSYC 2015	Research Methods [1]	4
CS 3750	Human Computer Interface Design and Evaluation [1]	3
or CS 3751	Introduction to User Interface Design	
Select two of the following for Human-Centered Technology: [1]		6
CS 3790	Introduction to Cognitive Science	
CS 4660	Introduction to Educational Technology	
CS 4460	Introduction to Information Visualization	
CS 4470	Introduction to User Interface Software	
CS 4605	Mobile and Ubiquitous Computing	
CS 4472	Design of Online Communities	
CS 4745	Information and Communication Technologies and Global Development	
Select one of the following for Social/Behavioral Science for Computing: [1]		3
PSYC 2210	Social Psychology	
PSYC 2760	Human Language Processing	
PSYC 3040	Sensation and Perception	
Select one of the following for Systems Software Tools: [1]		3
CS 3300	Introduction to Software Engineering	
CS 4240	Compilers, Interpreters, and Program Analyzers	
Select one of the following for Advanced Systems Architectures: [1]		3
CS 4210	Advanced Operating Systems	
CS 4220	Programming Embedded Systems	
CS 4290	Advanced Computer Organization	
Other Required Courses		

MATH 3012	Applied Combinatorics	3
Select one of the following:		3
MATH 3215	Introduction to Probability and Statistics	
MATH 3670	Probability and Statistics with Applications	
CEE 3770	Statistics and Applications	
ISYE 3770	Statistics and Applications	
or ISYE 2027 & ISYE 2028	Probability with Applications and Basic Statistical Methods	
Free Electives		
Free Electives		4
Total Credit Hours		**126**

Pass-fail only for Free electives (max six credit hours) and CS 1100.

1 Minimum grade of C required.
2 Two of three lab sciences MUST be a sequence.
3 Junior Design Options are as follows (students must pick one option and may not change):

- Option 1 - LMC 3432, LMC 3431, CS 3311,CS 3312.
- Option 2 - ECE VIP courses and LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option.
- Option 4- CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours), LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit.
Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.
4 Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computer Science - Thread: Theory & Information Internetworks

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
Lab Science [2]		4
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [4]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
Lab Science [2]		4
CS 1100	Freshman Leap Seminar	1
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [4]	2
Major Requirements		
CS 2340	Objects and Design [1]	3
Select one for Professionalism/Ethics requirement: [1]		3
CS 3001	Computing, Society, and Professionalism	
CS 4001	Computing, Society, and Professionalism	
CS 4002	Robots and Society	
CS 4003	AI, Ethics, and Society	
CS 4726	Privacy, Technology, Policy, and Law	
SLS 3110	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,3]		6
Concentration		
CS 2110	Computer Organization and Programming [1]	4
CS 2200	Computer Systems and Networks [1]	4
CS 3510	Design and Analysis of Algorithms [1]	3
or CS 3511	Design and Analysis of Algorithms, Honors	
CS 4510	Automata and Complexity Theory [1]	3
CS 4540	Advanced Algorithms [1]	3
MATH 3406	A Second Course in Linear Algebra [1]	3
Select six credit hours of the following for Introduction to Information Management: [1]		6
CS 3251	Computer Networking I	
CS 4235	Introduction to Information Security	
CS 4400	Introduction to Database Systems	

Select one of the following for Advanced Information Management: [1]		3
CS 3251	Computer Networking I (if not taken for Introduction to Information Management)	
CS 4235	Introduction to Information Security (if not taken for Introduction to Information Management)	
CS 4251	Computer Networking II	
CS 4255	Introduction to Network Management	
CS 4261	Mobile Applications and Services for Converged Networks	
CS 4262	Network Security	
CS 4270	Data Communications Laboratory	
CS 4365	Introduction to Enterprise Computing	
CS 4400	Introduction to Database Systems (if not taken for Introduction to Information Management)	
CS 4420	Database System Implementation	
CS 4440	Emerging Database Technologies and Applications	
CS 4675	Internet Computing Systems, Services and Applications	
Select one of the following for Advanced Mathematics: [1]		3
MATH 4022	Introduction to Graph Theory	
MATH 4032	Combinatorial Analysis	
MATH 4150	Introduction to Number Theory	
Other Required Courses		
MATH 3012	Applied Combinatorics	3
Select one of the following:		3
MATH 3215	Introduction to Probability and Statistics	
MATH 3670	Probability and Statistics with Applications	
CEE 3770	Statistics and Applications	
ISYE 3770	Statistics and Applications	
or ISYE 2 & ISYE 2	Probability with Applications and Basic Statistical Methods	
Free Electives		
Free Electives		13
Total Credit Hours		**126**

Pass-fail only allowed for Free Electives (max 6 credit hours) and CS 1100.

1 Minimum grade of C required.
2 Two of three labs MUST be a sequence.
3 Junior Design Options are as follows (students must pick one option and may not change):
- Option 1 - LMC 3432, LMC 3431, CS 3311,CS 3312.
- Option 2 - ECE VIP courses and LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option.
- Option 4- CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours), LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit.
Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.
4 Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computer Science - Thread: Theory & Intelligence

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
Lab Science [2]		4
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [4]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
PSYC 1101	General Psychology	3
Any SS		6
Core F - Courses Related to Major		
Lab Science [2]		4
CS 1100	Freshman Leap Seminar	1
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3

or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [4]	2
Major Requirements		
CS 2340	Objects and Design [1]	3
Select one for Professionalism/Ethics requirement: [1]		3
CS 3001	Computing, Society, and Professionalism	
CS 4001	Computing, Society, and Professionalism	
CS 4002	Robots and Society	
CS 4003	AI, Ethics, and Society	
CS 4726	Privacy, Technology, Policy, and Law	
SLS 3110	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,3]		6
Concentration		
CS 2110	Computer Organization and Programming [1]	4
CS 3510	Design and Analysis of Algorithms [1]	3
or CS 3511	Design and Analysis of Algorithms, Honors	
CS 3600	Introduction to Artificial Intelligence [1]	3
CS 4540	Advanced Algorithms [1]	3
MATH 3406	A Second Course in Linear Algebra [1]	3
Select one of the following for Advanced Mathematics: [1]		3
MATH 4022	Introduction to Graph Theory	
MATH 4032	Combinatorial Analysis	
MATH 4150	Introduction to Number Theory	
Select one of the following for Embodied Intelligence: [1]		3
CS 3630	Introduction to Perception and Robotics	
CS 3790	Introduction to Cognitive Science	
PSYC 3040	Sensation and Perception	
Select three of the following for Approaches to Intelligence: [1]		9
CS 4476	Introduction to Computer Vision	
CS 4510	Automata and Complexity Theory [1]	
CS 4635	Knowledge-Based Artificial Intelligence	
CS 4641	Machine Learning	
CS 4644	Deep Learning	
CS 4646	Machine Learning for Trading	
CS 4649	Robot Intelli Planning	
CS 4650	Natural Language Understanding	
CS 4731	Game AI	
Other Required Courses		
MATH 3012	Applied Combinatorics	3
Select one of the following:		3
MATH 3215	Introduction to Probability and Statistics	
MATH 3670	Probability and Statistics with Applications	
CEE 3770	Statistics and Applications	
ISYE 3770	Statistics and Applications	
or ISYE 2027	Probability with Applications	
& ISYE 2028	and Basic Statistical Methods	
Free Electives		
Free Electives		14
Total Credit Hours		**126**

Pass-fail only allowed for Free Electives (max 6 credit hours) and CS 1100.

1 Minimum grade of C required.

2 Two of three lab sciences MUST be a sequence.

3 Junior Design Options are as follows (students must pick one option and may not change):

- Option 1 - LMC 3432, LMC 3431, CS 3311,CS 3312.
- Option 2 - ECE VIP courses and LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option.
- Option 4- CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours), LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit.

Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.

4 Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computer Science - Thread: Theory & Media

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
Lab Science [2]		4
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [4]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	

INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
Lab Science [2]		4
CS 1100	Freshman Leap Seminar	1
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [4]	2
Major Requirements		
CS 2340	Objects and Design [1]	3
Select one for the Professionalism/Ethics requirement: [1]		3
CS 3001	Computing, Society, and Professionalism	
CS 4001	Computing, Society, and Professionalism	
CS 4002	Robots and Society	
CS 4003	AI, Ethics, and Society	
CS 4726	Privacy, Technology, Policy, and Law	
SLS 3110	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,3]		6
Concentration		
CS 2110	Computer Organization and Programming [1]	4
CS 3510	Design and Analysis of Algorithms [1]	3
or CS 3511	Design and Analysis of Algorithms, Honors	
CS 4510	Automata and Complexity Theory [1]	3
CS 4540	Advanced Algorithms [1]	3
MATH 3406	A Second Course in Linear Algebra [1]	3
Select three of the following for Media Technologies: [1]		9
CS 3451	Computer Graphics	
CS 4455	Video Game Design and Programming	
CS 4460	Introduction to Information Visualization	
CS 4464	Computational Journalism	
CS 4475	Computational Photography	
CS 4480	Digital Video Special Effects	
CS 4488	Procedural Content Generation	
CS 4496	Computer Animation	
CS 4497	Computational Aesthetics	
CS 4590	Principles and Applications of Computer Audio	
Select one of the following for Advanced Mathematics: [1]		3
MATH 4022	Introduction to Graph Theory	
MATH 4032	Combinatorial Analysis	
MATH 4150	Introduction to Number Theory	
Other Required Courses		
MATH 3012	Applied Combinatorics	3
Select one of the following:		3
MATH 3215	Introduction to Probability and Statistics	
MATH 3670	Probability and Statistics with Applications	
CEE 3770	Statistics and Applications	
ISYE 3770	Statistics and Applications	
or ISYE 2027 & ISYE 2028	Probability with Applications and Basic Statistical Methods	6
Free Electives		
Free Electives		17
Total Credit Hours		**126**

Pass-Fail only allowed for Free Electives (max six credit hours) and CS 1100.

1 Minimum grade of C required.
2 Two of three lab sciences MUST be a sequence.
3 Junior Design Options are as follows (students must pick one option and may not change):
- Option 1 - LMC 3432, LMC 3431, CS 3311,CS 3312.
- Option 2 - ECE VIP courses and LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option.
- Option 4- CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours), LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit.
Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.
4 Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computer Science - Thread: Theory & People

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		

PHYS 2211	Introductory Physics I [2]	4
Lab Science [2]		4
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [4]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
PSYC 1101	General Psychology	3
Any SS		6
Core F - Courses Related to Major		
Lab Science [2]		4
CS 1100	Freshman Leap Seminar	1
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [4]	2
Major Requirements		
CS 2340	Objects and Design [1]	3
Select one for Professionalism/Ethics requirement: [1]		3
CS 3001	Computing, Society, and Professionalism	
CS 4001	Computing, Society, and Professionalism	
CS 4002	Robots and Society	
CS 4003	AI, Ethics, and Society	
CS 4726	Privacy, Technology, Policy, and Law	
SLS 3110	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,3]		6
Concentration		
CS 2110	Computer Organization and Programming [1]	4
CS 3510	Design and Analysis of Algorithms [1]	3
or CS 3511	Design and Analysis of Algorithms, Honors	
CS 4510	Automata and Complexity Theory [1]	3
CS 4540	Advanced Algorithms [1]	3
MATH 3406	A Second Course in Linear Algebra [1]	3
PSYC 2015	Research Methods [1]	4
CS 3750	Human Computer Interface Design and Evaluation [1]	3
or CS 3751	Introduction to User Interface Design	
Select two of the following for Human-Centered Technlogy: [1]		6
CS 3790	Introduction to Cognitive Science	
CS 4660	Introduction to Educational Technology	
CS 4460	Introduction to Information Visualization	
CS 4470	Introduction to User Interface Software	
CS 4472	Design of Online Communities	
CS 4605	Mobile and Ubiquitous Computing	
CS 4745	Information and Communication Technologies and Global Development	
Select one of the following for Social/Behavioral Science for Computing: [1]		3
PSYC 2210	Social Psychology	
PSYC 2760	Human Language Processing	
PSYC 3040	Sensation and Perception	
Select one of the following for Advanced Mathematics: [1]		3
MATH 4022	Introduction to Graph Theory	
MATH 4150	Introduction to Number Theory	
MATH 4032	Combinatorial Analysis	
Other Required Courses		
MATH 3012	Applied Combinatorics	3
Select one of the following:		3
MATH 3215	Introduction to Probability and Statistics	
MATH 3670	Probability and Statistics with Applications	
CEE 3770	Statistics and Applications	
ISYE 3770	Statistics and Applications	
or ISYE 2027 & ISYE 2028	Probability with Applications and Basic Statistical Methods	
Free Electives		
Free Electives		10
Total Credit Hours		**126**

Pass-fail only allowed for Free Electives (max 6 hours) and CS 1100.

1 Minimum grade of C required.

2 Two of three lab sciences MUST be a sequence.

3 Junior Design Options are as follows (students must pick one option and may not change):

- Option 1 - LMC 3432, LMC 3431, CS 3311,CS 3312.
- Option 2 - ECE VIP courses and LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option.
- Option 4- CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours), LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit.

Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.

4 Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

Bachelor of Science in Computer Science - Thread: Theory & Systems and Architecture

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [1]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
Lab Science [2]		4
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra [4]	4
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Choose one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
Lab Science [2]		4
CS 1100	Freshman Leap Seminar	1
CS 1331	Introduction to Object Oriented Programming [1]	3
CS 1332	Data Structures and Algorithms for Applications [1]	3
CS 2050	Introduction to Discrete Mathematics for Computer Science [1]	3
or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus [4]	2
Major Requirements		
CS 2340	Objects and Design [1]	3
Select one for Professionalism/Ethics requirement: [1]		3
CS 3001	Computing, Society, and Professionalism	
CS 4001	Computing, Society, and Professionalism	
CS 4002	Robots and Society	
CS 4003	AI, Ethics, and Society	
CS 4726	Privacy, Technology, Policy, and Law	
SLS 3110	Technology and Sustainable Community Development	
Junior Design Options (Capstone)		
Junior Design Option [1,3]		6
Concentration		
CS 2110	Computer Organization and Programming [1]	4
CS 2200	Computer Systems and Networks [1]	4
CS 3210	Design of Operating Systems [1]	3
CS 3220	Computer Structures: Hardware/Software Codesign of a Processor [1]	3
CS 3510	Design and Analysis of Algorithms [1]	3
or CS 3511	Design and Analysis of Algorithms, Honors	
ECE 2031	Digital Design Laboratory [1]	2
CS 4510	Automata and Complexity Theory [1]	3
CS 4540	Advanced Algorithms [1]	3
Select one of the following for Systems Software Tools: [1]		3
CS 3300	Introduction to Software Engineering	
CS 4240	Compilers, Interpreters, and Program Analyzers	
Select one of the following for Advanced Systems Architectures: [1]		3
CS 4210	Advanced Operating Systems	
CS 4220	Programming Embedded Systems	
CS 4290	Advanced Computer Organization	
MATH 3406	A Second Course in Linear Algebra [1]	3
Select one of the following for Advanced Mathematics: [1]		3
MATH 4022	Introduction to Graph Theory	
MATH 4032	Combinatorial Analysis	
MATH 4150	Introduction to Number Theory	
Other Required Courses		
MATH 3012	Applied Combinatorics	3
Select one of the following:		3
MATH 3215	Introduction to Probability and Statistics	
MATH 3670	Probability and Statistics with Applications	
CEE 3770	Statistics and Applications	
ISYE 3770	Statistics and Applications	
or ISYE 2027 & ISYE 2028	Probability with Applications and Basic Statistical Methods	
Free Electives		
Free Electives		8
Total Credit Hours		**126**

Pass-fail only allowed for Free Electives (max 6 credit hours) and CS 1100.

1 Minimum grade of a C required.
2 Two of three lab sciences MUST be a sequence.
3 Junior Design Options are as follows (students must pick one option and may not change):
- Option 1 - LMC 3432, LMC 3431, CS 3311,CS 3312.
- Option 2 - ECE VIP courses and LMC 3403.
- Option 3 - Satisfy Georgia Tech Research Option.
- Option 4- CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) = 9 hours OR CS 4699- I2P (6 hours), LMC 3403 (3 hours) = 9 hours

Six credits of the Junior Design option are used as Major Requirements and the overage credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit.
Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-ip Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.

[4] Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.

BACHELOR OF SCIENCE IN EARTH AND ATMOSPHERIC SCIENCES

The EAS degree is comparable to traditional degrees in meteorology and environmental sciences, but the program has several unique attributes. EAS courses provide "hands-on" experiences in collection and interpretation of environmental data and in predictive modeling. The integrated approach of the program gives a broad environmental background while still allowing students to specialize in meteorology, earth science, education, or a business option. The program prepares students for graduate study or immediate employment in fields such as meteorology, air quality, environmental chemistry, exploration geophysics, geological engineering, geological hazards, impact assessment, and environmental policy. Electives (30 hours), both within the School and in other units of Georgia Tech, allow students considerable flexibility in tailoring their degree programs according to individual career goals. The School provides incentives and encouragement for undergraduate students to participate in ongoing research with the faculty.

EAS Undergraduate Information

- Bachelor of Science in Earth and Atmospheric Sciences - General
- Bachelor of Science in Earth and Atmospheric Sciences - Business Option

International Plan

The EAS with International Plan (EAS-IP) is designed to give a student a solid, global competence within the context of an Earth and Atmospheric Science degree.

The major course requirements are the same for both EAS and EAS-IP. Where they differ is that for the EAS-IP degree, a student:

1. Spends 26 weeks abroad engaged in any combination of study abroad, research, or internship.
2. Takes their Social Science/Humanities electives in targeted areas:
   a. International relations
   b. Global economics
   c. A course about a particular country or region
3. Complete the equivalent to two years of college-level language study. See Georgia IP requirements for the different options: www.internationalplan.gatech.edu/
4. Complete a capstone course that combines their global experience with their EAS degree.

EAS Undergraduate Information

Research Option

The BS in Earth and Atmospheric Sciences with Research Option allows students to emphasize their interest in research. To complete the Research Option in the School of Earth and Atmospheric Sciences students must:

1. Complete at least nine units of undergraduate research
   a. Courses should span at least two, preferably three terms (note there is also a two semester sequence of proposal and thesis writing courses - see below)
   b. Research may be for either pay (EAS 4698) or credit (EAS 4699)
   c. At least six of the nine required credit hours should be on the same topic
2. Complete a research proposal outlining their research topic and project for the thesis while taking LMC 4701.
3. Write an undergraduate thesis/report of research on their findings while taking LMC 4702.

To submit your intent form to Undergraduate Research Opportunities Program (UROP), please go to the web form at http://undergradresearch.gatech.edu/ This form must be completed and can also be reached from the main UROP webpage.

For further information, consult the EAS Undergraduate Coordinator.

General Research Option Information

BS/MS Earth and Atmospheric Sciences

EAS offers a BS/MS Program. EAS majors may apply to the BS/MS program after completing at least thirty semester credit hours at Georgia Tech with a GPA of at least 3.5.

Students admitted to the program must maintain a cumulative GPA of at least 3.0.

As part of the program, students may use up to 6 credit hours of graduate-level coursework in the major discipline for both degrees.

To apply, complete the BS/MS application form, a biographical statement, and two letters of recommendation.

EAS Undergraduate Information

Bachelor of Science in Earth and Atmospheric Sciences - Business Option

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1371	Computing for Engineers [2]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
CHEM 1211K	Chemical Principles I	4
MATH 1551	Differential Calculus [2]	2
MATH 1553	Introduction to Linear Algebra [2]	2
Core E - Social Sciences		
Select one of the following:		3

HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
ECON 2106	Principles of Microeconomics	3
Any SS		6
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
CHEM 1212K	Chemical Principles II [2]	4
or PHYS 22	Introductory Physics II	
EAS Technical Electives		5
EAS Core		
EAS 1600	Introduction to Environmental Science	4
EAS 2600	Earth Processes	4
EAS 2655	Quantitative Techniques in Earth and Atmospheric Sciences	3
EAS 3603	Thermodynamics of Earth Systems	3
Select two of the following:		6
EAS 3610	Introduction to Geophysics	
EAS 4200	Structural Geology and Continuum Mechanics [4]	
EAS 4220	Environmental Geochemistry	
EAS 4305	Physical and Chemical Oceanography	
EAS 4370	Physics of Planets	
EAS 4655	Atmospheric Dynamics	
EAS 4740	Atmospheric Chemistry Laboratory	
Select one of the following:		1
EAS 4200	Structural Geology and Continuum Mechanics [4]	
EAS 4221	Environmental Geochemistry Lab	
EAS 4656	Atmospheric Dynamics Practicum	
EAS 4420 & EAS 4610	Environmental Field Methods and Earth System Modeling	7
EAS Technical Electives		
Select 8 credit hours from the following: [1]		8
CEE 4210	Hydrology	
CEE 4300	Environmental Engineering Systems	
CEE 4330	Air Pollution Engineering	
EAS 1601	Habitable Planet	
EAS 2420	Environmental Measures of Urban and Regional Change	
EAS 2551	Introduction to Meteorological Analysis	
EAS 2750	Physics of the Weather	
EAS 3000-level or higher		
Business Option		
ACCT 2101	Accounting I: Financial Accounting	3
or MGT 3006	Financial and Managerial Accounting	
MGT 3101	Organizational Behavior	3
or MGT 315	Principles of Management	
or PSYC 22	Industrial/Organizational Psychology	
Select two of the following:		6
MGT 3062	Financial Management	
MGT 3078	Finance and Investments	
MGT 3300	Marketing Management I	
MGT 3660	International Business	
MGT 4015	Advanced Managerial Accounting	
MGT 4026	Financial Reporting and Analysis I	
MGT 4028	Financial Analysis and Reporting of Technology Firms	
MGT 4030	International Accounting	
MGT 4190	Strategic Quality Management and Competitiveness	
MGT 4191	The Entrepreneurship Forum	
MGT 4192	Impact Speaker Series Forum	
MGT 4193	Servant Leadership, Values & Systems	
MGT 4194	Social Enterprise and Entrepreneurship	
MGT 4303	Personal Selling and Sales Management	
MGT 4304	Strategic Brand Management	
MGT 4307	Strategic Marketing	
MGT 4335	International Marketing	
MGT 4610	Law, Management, and Economics	
MGT 4670	Entrepreneurship	
Free Electives		
Free Electives [3]		12
Total Credit Hours		**122**

Pass/fail allowed only for Humanities, Social Sciences, and Free Electives.

1. Limit six credit hours total of EAS 4699 and EAS 4651 towards Technical Electives.
2. Minimum grade of C required.
3. GT 1000 recommended
4. If EAS 4200 is completed, then 1-credit hour may be applied to satisfy the EAS Breadth Lab Elective requirement.

Bachelor of Science in Earth and Atmospheric Sciences - General

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1371	Computing for Engineers [2]	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		

PHYS 2211	Introductory Physics I [2]	4
CHEM 1211K	Chemical Principles I	4
MATH 1551	Differential Calculus [2]	2
MATH 1553	Introduction to Linear Algebra [2]	2
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
CHEM 1212K	Chemical Principles II	4
or PHYS 2212	Introductory Physics II	
EAS Technical Electives		5
EAS Core		
EAS 1600	Introduction to Environmental Science	4
EAS 2600	Earth Processes	4
EAS 2655	Quantitative Techniques in Earth and Atmospheric Sciences	3
EAS 3603	Thermodynamics of Earth Systems	3
Select two of the following:		6
EAS 3610	Introduction to Geophysics	
EAS 4200	Structural Geology and Continuum Mechanics [4]	
EAS 4220	Environmental Geochemistry	
EAS 4305	Physical and Chemical Oceanography	
EAS 4370	Physics of Planets	
EAS 4655	Atmospheric Dynamics	
EAS 4740	Atmospheric Chemistry Laboratory	
Select one of the following:		1
EAS 4200	Structural Geology and Continuum Mechanics [4]	
EAS 4221	Environmental Geochemistry Lab	
EAS 4656	Atmospheric Dynamics Practicum	
EAS Capstone [5]		7
EAS 4420	Environmental Field Methods	
EAS 4610	Earth System Modeling	
Research Option		
EAS Technical Electives		
Select 14 credit hours from the following: [1]		14
CEE 4210	Hydrology	
CEE 4300	Environmental Engineering Systems	
CEE 4330	Air Pollution Engineering	
EAS 1601	Habitable Planet	
EAS 2420	Environmental Measures of Urban and Regional Change	
EAS 2551	Introduction to Meteorological Analysis	
EAS 2750	Physics of the Weather	
EAS 3000-level or higher		
Free Electives		
Free Electives [3]		18
Total Credit Hours		**122**

Pass/fail allowed only for Humanities, Social Sciences, and Free Electives.

1. Limit six credit hours total of EAS 4699 and EAS 4651 towards Technical Electives.
2. Minimum grade of C required.
3. GT 1000 recommended
4. If EAS 4200 is completed, then 1-credit hour may be applied to satisfy the EAS Breadth Lab Elective requirement.
5. Students must pick 2 of 3 to complete EAS Capstone.

BACHELOR OF SCIENCE IN ECONOMICS

The economics major provides in depth exposure to the fundamental economic way of thinking and approaching a multitude of complex problems. Students will be exposed to micro and macro-economic theory, data science and analysis (econometrics), and relevant field courses throughout the program of study. Field courses cover a variety of topics such as Health Economics, Economics of Trade, Development Economics, and Environmental Economics.

The courses included in the major allow students to diversify their analytical skill sets with practice in computation and data analysis, fundamental economic theory, and empirical methods. The economics minor provides excellent concrete data science skills directly applicable for pursuing careers in multiple sectors.

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1315	Introduction to Media Computation	3
or CS 1301	Introduction to Computing	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
ECON 2105	Principles of Macroeconomics [3]	3
ECON 2106	Principles of Microeconomics [3]	3
ECON 2250	Statistics for Economists	3
INTA 1000- or 2000-level courses		3
Engineering or Science Elective [1]		3
Second Tech Course [2]		3
Major Requirements		
ECON 3110	Advanced Microeconomic Analysis [3]	3
ECON 3120	Advanced Macroeconomic Analysis [3]	3
ECON 3161	Econometric Analysis [3]	3
ECON Electives		
Any ECON [3]		18
Non-Major Cluster		
Non-Major Cluster [4,5]		12
Free Electives		
Free Electives [5]		20
Total Credit Hours		**122**

Pass-fail only allowed for Free Electives.

Students must complete 39 hours of upper level (3000-/4000-level) courses. This requirement may be satisfied with a combination of major requirements, ECON electives, Non-Major Cluster courses and/or free electives.

1. 1000- or 2000-level course from the College of Engineering or College of Sciences. Please consult with advisor.
2. Must be selected from: CEE 1770 or CS 1316 or CS 1331 or CS 1332 or ECE 2030 or ME 1770 or ME 2016 or MGT 2210
3. Minimum grade of C required.
4. All twelve credit hours must come from the same discipline, or be part of a coherent theme. Please consult with advisor on course selection.
5. Courses may be applied toward completion of a minor.

International Plan

All degree programs offered by the School of Economics including the BS degree in Economics offer an International Plan (IP) Designation. In general the IP designation can be obtained by completing courses in three specified area:

1. Students are required to complete a general course in Global Economics.
2. Students are also required to complete a region specific course. Any number of International Affairs course can be used to fulfill this requirement
3. Student are also required to complete a capstone course rounding out the international experience. The IP designation also requires students to become proficient in a language as well as spending at least twenty-six weeks in a foreign culture enrolled in school and/or participating in an internship experience.

Research Option

The School of Economics also participates in the Research Option plan offered by the Undergraduate Research Opportunities Program (UROP). The Research Option offers students the opportunity for in-depth research experience working under the guidance of a faculty mentor. Requirements for participation in the Research Option include completing nine hours of undergraduate research, at least six of which are on the same topic, writing a research proposal, taking two 1-hour courses: LMC 4701 (typically taken during the first or second semester of research) and LMC 4702 (taken during the term in which the thesis is written), and completing the thesis.

BS/MS in Economics

Students with a GPA of 3.25 or higher in ECON courses are eligible to apply for the program after completion of 30 semester credit hours at Georgia Tech, but before the completion of 75 semester credit hours, including transfer and advanced placement credits. Students who have more than 75 credit hours will be considered for the program on a case-by-case basis. Admissions decisions will be based on GPA and judgments of the Graduate Committee and faculty who have served as advisors or instructors. Continuation in the program will require the B.S. student to maintain a GPA of 3.25 or higher in their ECON courses. The program will not penalize students who opt out after the bachelor's degree.

Students in the BS-MS ECON program will take 6 hours of ECON electives at the 6000 level which will be used toward ECON electives in the BS in Economics program and may be used toward core requirements or electives in the MS in Economics program. Prior to enrolling in 6000-level ECON courses, students will be required to complete ECON 3110 Advanced Microeconomics, ECON 3120 Advanced Macroeconomics, and ECON 3161 Econometrics.

Students are encouraged to take 6 credit hours from the MSECON core courses (ECON 6105, ECON 6106, ECON 6140, or ECON 6160) during enrollment as a BS student. However, they will have flexibility to enroll in any 6000 ECON course whose prerequisite requirements they have met.

BACHELOR OF SCIENCE IN ECONOMICS AND INTERNATIONAL AFFAIRS

The primary objectives of the Bachelor of Science degree in Economics and International Affairs are to provide students with:

1. a detailed understanding of economic theory and practice in the contemporary world;
2. an understanding of the global, interdependent, and multicultural environment in which they live; and
3. a set of quantitative and qualitative analytical skills centered around policy-oriented issue areas in economics and international affairs. These skills will provide graduates with the capabilities to engage in strategic planning and analysis efforts in economic and international contexts.

Code	Title	Credit Hours
Wellness Requirement		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core IMPACTS		
Institutional Priority		
CS 1315	Introduction to Media Computation	3
Mathematics and Quantitative Skills		
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Political Science and U.S. History		
HIST 2111	The United States to 1877	3
or HIST 211	The United States since 1877	
or INTA 120	American Government in Comparative Perspective	
or POL 1101	Government of the United States	
or PUBP 300	American Constitutional Issues	
Arts, Humanities, and Ethics		
Modern Language [3]		6
Communicating in Writing		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
Technology, Mathematics, and Sciences		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Social Sciences		
INTA 2040	Science, Technology, and International Affairs [3]	3
INTA 3301	International Political Economy [3]	3
Select one of the following:		3
HTS 1031	Europe Since the Renaissance	
HTS 2036	Revolutionary Europe: 1789-1914	
HTS 2037	Twentieth Century Europe: 1914 to Present	
HTS 2040	History of Islamic Societies	
HTS 2041	History of the Modern Middle East	
HTS 2061	Traditional Asia and Its Legacy	
HTS 2062	Asia in the Modern World	
HTS 3028	Ancient Greece: Gods, Heroes, and RuinS	
HTS 3029	Ancient Rome: From Greatness to Ruins	
HTS 3030	Medieval Europe: 350 to 1400	
HTS 3031	European Labor History	
HTS 3032	Modern European Intellectual History	
HTS 3033	Medieval England	
HTS 3035	Britain from 1815-1914	
HTS 3036	Britain Since 1914	
HTS 3038	The French Revolution	
HTS 3039	Modern France	
HTS 3041	Modern Spain	
HTS 3043	Modern Germany	
HTS 3045	Nazi Germany and the Holocaust	
HTS 3046	Science, Polilitics, and Culture in Nazi Germany	
HTS 3051	Women and the Politics of Gender in the Middle East	
HTS 3061	Modern China	
HTS 3062	Modern Japan	
HTS 3063	Outposts of Empire: Comparative History of British	
HTS 3065	History of Global Societies	
HTS 3067	Revolutionary Movements in the Modern World	
HTS 3069	Modern Cuba	
Field of Study		
ECON 2105	Principles of Macroeconomics [3]	3
ECON 2106	Principles of Microeconomics [3]	3
ECON 2250	Statistics for Economists	3
INTA 1110	Introduction to International Relations	3
Modern Language [1,3]		6
Major Requirements		
ECON 3110	Advanced Microeconomic Analysis [3]	3
ECON 3120	Advanced Macroeconomic Analysis [3]	3
ECON 3161	Econometric Analysis [3]	3
ECON 4351	International Financial Economics	3
or ECON 435	International Trade Theory and Policy	
INTA 2001	Careers in International Affairs [3]	1
INTA 3110	U.S. Foreign Policy [3]	3
INTA 3203	Comparative Politics [3]	3
INTA 4740	Seminar in Political Economy [3]	3
or ECON 474	Seminar in Political Economy	
EIA Electives		
Any ECON [3]		6
Any INTA [3]		6
Any ECON or INTA [3,5]		3
Non-Major Cluster		
Non-Major Cluster [2]		9
Technical Requirement		
Select one of the following: [4]		3

	BMED 2400	Introduction to Bioengineering Statistics
	CP 4510	Fundamentals of Geographic Information Systems
	CS 1301	Introduction to Computing
	CS 1316	Representing Structure and Behavior
	CS 2316	Data Manipulation for Science and Industry
	CS 1331	Introduction to Object Oriented Programming
	EAS 3110	Energy, Environment, and Society
	EAS 4480	Environmental Data Analysis
	ID 3103	Industrial Design Computing I
	ME 2016	Computer Applications
	MGT 2210	Information Systems and Digital Transformation
	MGT 4051	Decision Support and Expert Systems
	MGT 4052	Systems Analysis and Design
Free Electives		
Free Electives		10
Total Credit Hours		**122**

Pass-fail only allowed for Free Electives.

39 hours of the degree must be upper division coursework. 15 hours of the Cluster, Free electives, ECON/INTA electives, or Technology requirement must be upper division (3000/4000 level).

[1] Modern Language courses must be in the same language as used in Core IMPACTS Arts, Humanities, and Ethics area.
[2] All nine credit hours must come from the same discipline, or be part of a coherent theme. Please consult with advisor on course selection.
[3] Minimum grade of C required.
[4] Approved instances of CS 2803 may be applied by advisor.
[5] Must be 3000-level or higher

Research Option

The Sam Nunn School of International Affairs also participates in the Research Option plan offered by the Undergraduate Research Opportunities Program (UROP). The Research Option offers students the opportunity for in-depth research experience working under the guidance of a faculty mentor. Requirements for participation in the Research Option include completing nine hours of undergraduate research, at least six of which are on the same topic, writing a research proposal, taking two 1-hour courses: LMC 4701 Undergraduate Research Proposal Writing (typically taken during the first or second semester of research) and LMC 4702 Undergraduate Research Thesis Writing (taken during the term in which the thesis is written), and completing the thesis. Students are also required to send a weekly update of progress of research to the faculty mentor. Along with their application, students must explain how the faculty mentor's research experience will benefit the student's research.

International Plan

The BS degree in Economics and International Affairs with the International Plan designator provide students with:

1. a detailed understanding of economic theory and practice in the contemporary world;
2. an understanding of the global, interdependent, and multicultural environment in which they live; and
3. a set of quantitative and qualitative analytical skills centered around policy-oriented issue areas in economics and international affairs. These skills will provide graduates with the capabilities to engage in strategic planning and analysis efforts in economic and international contexts

All degree programs offered by the School of Economics including the BS Degree Economics International Affairs offer an International Plan (IP) Designation. In general the IP designation can be obtained by completing courses in three specified area:

1. Students are required to complete a general course in Global Economics. Economics 2101 has been approved by the IP committee to fulfill this requirement
2. Students are also required to complete a region specific course. Any number of International Affairs course can be used to fulfill this requirement
3. Student are also required to complete are capstone course rounding out the international experience. The IP designation also requires students to become proficient in a language as well as spending at least twenty-six week in a foreign culture enrolled School and/or participating in an internship experience

Bachelor of Science in Economics & International Affairs/Master of Science in Economics (BSMS Option)

Students with a GPA of 3.5 or higher in EIA courses are eligible to apply for the program after completion of 30 semester credit hours at Georgia Tech, but before the completion of 75 semester credit hours, including transfer and advanced placement credits. Students who have more than 75 credit hours will be considered for the program on a case-by-case basis. Depending on demand, the required minimum GPA may be higher. Admissions decisions will be based on GPA and judgments of the Graduate Committee and faculty who have served as advisors or instructors. Continuation in the program will require the B.S. student to maintain a GPA of 3.5 or higher in their EIA courses. The program will not penalize students who opt out after the bachelor's degree.

Students pursuing the BSEIA/MSECON option will be required to take six (6) hours of ECON electives at the 6000 level while enrolled as an undergraduate student. Prior to enrolling in 6000-level ECON courses, students will be required to complete ECON 3110, ECON 3120, and ECON 3161. The 6000-level ECON courses will be used toward the BSEIA requirements as the required ECON electives.

Students are encouraged to take six (6) credit hours from ECON 6105, ECON 6106, ECON 6140, or ECON 6160 (the "core" MS ECON courses) during enrollment as an undergraduate student. However, there will be flexibility to enroll in any 6000 ECON course as long as pre-requisites are met. Currently, there are over a dozen ECON courses offered at the 6000-level which only have 4000-level prerequisite courses that an undergraduate student is likely to be able to meet.

Bachelor of Science in Economics & International Affairs/Master of Science in International Affairs (BS/MS Option)

The Sam Nunn School of International Affairs offers a BS/MS program for students enrolled in the Economics and International Affairs

undergraduate program who demonstrate an interest in and ability for additional education beyond the BS degree.

Students in the BS/MS program will remain undergraduates until they meet requirements for the undergraduate degree, at which point they will receive their BS degree and be changed to graduate status. Students will be eligible to apply for the program after completion of 45 semester credit hours at Georgia Tech (i.e., at the end of their third semester), and if they show appropriate progress in their degree program thereafter. Any student in good standing in the BS EIA program is eligible to apply to the program. Admissions decisions will be based on GPA and judgments of the faculty who have served as advisors or instructors. Continuation in the program will require the student to maintain a GPA of 3.5 or higher in Ivan Allen College courses. The program will not penalize students who opt out after the bachelor's degree. Students participating in this program will be eligible for the six-semester credit-hour Graduate Course Option, which allows students completing both the bachelor's and master's in the same discipline to use up to 6 credit hours of graduate-level coursework in the major discipline for both degrees.

Contact the BS/MS International Affairs program director for further information.
https://inta.gatech.edu/programs/graduate/five-year-bsms-inta

BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING

The School of Electrical and Computer Engineering offers two undergraduate degree programs:

- electrical engineering (EE) and
- computer engineering (CmpE).

Both programs include elective hours, enabling students to individually tailor their programs to provide emphasis in a particular specialization or exposure to a broad range of subjects. Engineering analysis and design concepts are integrated throughout both programs, culminating in a common major design experience involving a broad range of issues including economic and societal considerations.

The EE program offers elective courses in a wide variety of specializations including analog electronics, bioengineering, computer engineering, systems and controls, microsystems and nanosystems, electronics packaging, digital signal processing, optics and photonics, electrical energy, electromagnetics, and telecommunications. Additionally, students may elect to take advanced courses in other programs such as computer science, mathematics, physics, or management.

Program Educational Objectives

Within five years after graduating, the Georgia Institute of Technology School of Electrical and Computer Engineering graduates will have the skills, knowledge, and choices to:

- Be successful and recognized **leaders** in professional practice in electrical and computer engineering or in related fields.
- Be adaptive-learners and life-long **innovators** through advanced education/degrees, strategic professional development, and entrepreneurship that focuses on the needs of stakeholders.
- Be **problem solvers** who consider global, societal, and environmental impact and are prepared to address problems that are beyond conventional technical understanding and knowledge. Graduates will demonstrate technical competence, ethical reasoning, and creativity in identifying, formulating, analyzing, and developing solutions using appropriate techniques, skills, and tools.
- Be **team builders**, who lead and participate in culturally diverse teams and promote breadth of perspectives in developing, communicating, and executing solutions.

Signal & Information Processing – Robotics & Autonomous Systems

Signal & Information Processing – Telecommunications

Signal & Information Processing – Electronic Devices

Signal & Information Processing – Electrical Energy Systems

Signal & Information Processing – Circuit Technology

Signal & Information Processing – Bioengineering

Signal & Information Processing - Sensing & Exploration

Robotics & Autonomous Systems – Electronic Devices

Robotics & Autonomous Systems – Circuit Technology

Robotics & Autonomous Systems – Electrical Energy Systems

Robotics & Autonomous Systems – Bioengineering

Robotics & Autonomous Systems – Sensing & Exploration

Robotics & Autonomous Systems – Telecommunications

Telecommunications – Electric Energy Systems

Telecommunications – Bioengineering

Telecommunications – Sensing & Exploration

Electronic Devices – Electric Energy Systems

Electronic Devices – Circuit Technology

Electronic Devices – Bioengineering

Electronic Devices – Sensing & Exploration

Electronic Devices - Telecommunications

Circuit Technology – Electric Energy Systems

Circuit Technology – Bioengineering

Circuit Technology – Sensing & Exploration

Circuit Technology - Telecommunications

Bioengineering – Electric Energy Systems

Bioengineering – Sensing & Exploration

Electric Energy Systems – Sensing & Exploration

Cooperative Plan

The Georgia Tech Undergraduate Cooperative Education Program allows students to combine classroom study with paid practical work experience directly related to the academic major. Co-ops alternate semesters of on-campus study with semesters of full-time employment, normally beginning the program as freshmen or sophomores. Over 30 percent of ECE undergraduates participate in the co-op program.

The degree requirements for students in the co-op program are the same as those for other students in the major. The Cooperative Plan designation may be pursued separately or in combination with the International Plan and/or the Research Option.

Begun in 1912, Georgia Tech's program is currently the largest optional co-op program in the United States and has perennially been listed in U.S. News & World Report as one of the top ten co-op programs in America. As an integral part of the overall education experience, the co-op program allows students to take on increasing levels of responsibility and to use their job knowledge and classroom learning to make meaningful contributions to the organizations in which they work. Many co-op graduates are hired by their co-op employer, and more than 700 companies or government organizations throughout the United States and abroad currently employ Georgia Tech Undergrad Co-op Program students.

Because the School of ECE in Atlanta offers a wide range of electives and almost all required courses every term, including summer, co-op students

have substantial flexibility in completing their degree requirements. Many students continue their co-op work assignments through the senior year. Additionally, co-op students working in the Atlanta area may be able to take certain ECE courses, particularly laboratories offered in the evening, during the work term.

In addition to the co-op program, the Center for Career Discovery and Development also offers the Undergraduate Professional Internship and Work Abroad programs. These programs also provide opportunities for students to gain practical work experience, without the long-term commitment of the co-op program.

Center for Career Discovery and Development

International Plan

The International Plan is intended for students who seek an intensive international experience integrated into their undergraduate studies in electrical engineering. The International Plan develops global competence through a combination of coursework, language study, and residential overseas experience. Students who complete this option receive a designation on their transcript and diploma.

The electrical engineering aspects of the BS EE - International Plan degree requirements are identical to those for the regular BS EE. Please refer to the BS EE catalog description for general information about the degree program. Students may be able to satisfy the additional requirements imposed for the International Plan designation through appropriate choices of electives without additional credit hours to complete the degree. The International Plan designation may be pursued separately or in combination with the Cooperative Plan and/or the Research Option.

The School of Electrical and Computer Engineering offers a junior-year program at the Georgia Tech-Lorraine campus in Metz, France, that is designed to facilitate participation in the International Plan. However, electrical engineering majors are not restricted to this option and may complete any allowable courses, languages, and overseas experiences that satisfy the International Plan requirements.

BS EE Description
International Plan

Research Option

The Research Option is intended for students who seek a concentrated research experience, culminating in an undergraduate thesis, integrated into their undergraduate studies in electrical engineering. This option includes three or four semesters of structured research and provides an open evaluation of a student's research capabilities, viewable by the public via a required Web-based research portfolio. Students who complete this option receive a designation on their transcript.

The electrical engineering aspects of the BS EE - Research Option degree requirements are identical to those for the regular BS EE. Please refer to the BS EE catalog description for general information about the degree program. Students may be able to satisfy the additional requirements imposed for the Research Option designation through appropriate choices of electives without additional credit hours to complete the degree. The Research Option designation may be pursued separately, or in combination with the Cooperative Plan and/or the International Plan.

The School of Electrical and Computer Engineering (ECE) offers a two-semester Undergraduate Research Opportunity Program (UROP), which may be completed to provide a less-intensive research experience or as the initial phase of the Research Option. Contact the ECE Academic Office for additional information about the Research Option, including specific Institute and ECE requirements, and assistance in planning your schedule to allow participation in this program.

BS/MS Electrical and Computer Engineering

This program allows highly qualified students to receive the Bachelor of Science in either Electrical Engineering or Computer Engineering and a master's degree in Electrical and Computer Engineering. The joint BS/MS degree program affords undergraduate electrical or computer engineering majors the opportunity to broaden their studies and improve their career prospects.

Eligible Georgia Tech undergraduates normally apply for this program during their junior year. Contact the Electrical and Computer Engineering Graduate Affairs Office for program information, eligibility requirements, and applications.

BS/MS Information (5 Year)

Dual BS in Electrical Engineering

Georgia Tech & Korea Advanced Institute of Science and Tech

Students may pursue the BSEE degree from the Korea Advanced Institute of Science and Technology (KAIST) as they earn the BSEE or BSCmpE from Georgia Tech. KAIST offers one of the top engineering programs in Korea and the Far East. All lectures at KAIST are given in English to better serve a growing number of students from overseas. While earning their dual degrees, students spend two years each at both Georgia Tech and KAIST.

Bachelor of Science in Electrical Engineering - Signal & Information Processing and Bioengineering

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4

Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS [1]		6
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Science Elective [3]		3
Ethics Requirement [1]		
Probability/Statistics [6, 10]		3
Major Requirements		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 2026	Introduction to Signal Processing [2]	3
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
or ECE 2036	Engineering Software Design	
ECE 2040	Circuit Analysis [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
ECE 3025	Electromagnetics [2]	3
ECE 3040	Microelectronic Circuits [2]	4
ECE 3043	Measurements, Circuits, and Microelectronics Laboratory [2]	2
Bioengineering		
Select one of the following: [2,8]		3
ECE 4781	Biomedical Instrumentation [3]	
ECE 4782	Biosystems Analysis [3]	
ECE 4784	Engineering Electrophysiology [3]	
Select two of the following: [2,8]		6
ECE 3084	Signals and Systems	
ECE 4350	Electromagnetic and Microwave Applications	
ECE 4370	Antenna Engineering	
ECE 4435	Operational Amplifier Design	
ECE 4781	Biomedical Instrumentation	
ECE 4782	Biosystems Analysis	
ECE 4784	Engineering Electrophysiology	
Bioengineering Electives		
ECE 3000/4000 Elective [4]		3
Signal & Information Processing [10]		
Select one of the following: [2,8]		3
ECE 3251	Optimization for Information Systems	
ECE 4270	Fundamentals of Digital Signal Processing	
Select two of the following: [2,8]		6
ECE 3084	Signals and Systems	
ECE 3251	Optimization for Information Systems	
ECE 4122	Advanced Programming Techniques for Engineering Applications	
ECE 4180	Embedded Systems Design	
ECE 4260	Random Signals and Applications	
ECE 4270	Fundamentals of Digital Signal Processing	
ECE 4271	Applications of Digital Signal Processing	
ECE 4273	Design Synthesis of Application-specific Signal Processors	
ECE 4783	Introduction to Medical Image Processing	
Signal & Information Processing Electives		
ECE 3000/4000-level Elective [4]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [7]		3
Free Electives [5,9]		**11**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005.

Courses that are cross-listed with ECE must be taken under the ECE number.

1. Students must complete one Ethics course during their program. For a complete list of Ethics courses, please click here.
2. Minimum grade of C required.
3. Please select any academic course from the Schools of Biological Sciences, Chemistry, Earth and Atmospheric Sciences, or Physics. Research credits may not apply to this requirement.
4. ECE electives are subject to School approval and must satisfy the following constraints:
   1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
   2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.
5. The following courses are not allowed: ECE 3710, ECE 3741, HPS 1XXX, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113, and PHYS 2XXX (AP Credit). Maximum of six credit hours of Special Problems or research may be applied toward the degree
6. CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (must be taken for Letter Grade basis)
7. Senior Design requirements may be satisfied in the following ways:
   1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II

2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

[8] No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[9] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (7)

[10] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Electrical Engineering - Signal & Information Processing and Circuit Technology

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS [1]		6
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Science Elective [3]		3
Ethics Requirement [1]		
Probability/Statistics [6, 10]		3
Major Requirements		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 2026	Introduction to Signal Processing [2]	3
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
or ECE 2036	Engineering Software Design	
ECE 2040	Circuit Analysis [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
ECE 3025	Electromagnetics [2]	3
ECE 3040	Microelectronic Circuits [2]	4
ECE 3043	Measurements, Circuits, and Microelectronics Laboratory [2]	2
Circuit Technology [10]		
ECE 3400	Analog Electronics	3
ECE 4452	IC Fabrication	3
Select one of the following: [2,8]		3
ECE 4043	Senior Analog Electronics Laboratory	
ECE 4415	RF Engineering I	
ECE 4420	Digital Integrated Circuits	
ECE 4430	Analog Integrated Circuits	
ECE 4435	Operational Amplifier Design	
ECE 4502	Optical Fiber Communications	
ECE 4370	Antenna Engineering	
ECE 4391	Electromagnetic Compatibility	
Circuit Technology Electives		
ECE 3000/4000-level Elective [4]		3
Signal & Information Processing [10]		
Select one of the following: [2, 8]		3
ECE 3251	Optimization for Information Systems	
ECE 4270	Fundamentals of Digital Signal Processing	
Select two of the following: [2,8]		6
ECE 3084	Signals and Systems	
ECE 3251	Optimization for Information Systems	

ECE 4122	Advanced Programming Techniques for Engineering Applications	
ECE 4180	Embedded Systems Design	
ECE 4260	Random Signals and Applications	
ECE 4270	Fundamentals of Digital Signal Processing	
ECE 4271	Applications of Digital Signal Processing	
ECE 4273	Design Synthesis of Application-specific Signal Processors	
ECE 4783	Introduction to Medical Image Processing	
Signal & Information Processing Electives		
ECE 3000/4000-level Elective [4]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [7]		3
Free Electives [5,9]		**11**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005.

Courses that are cross-listed with ECE must be taken under the ECE number.

1 Students must complete one Ethics course during their program. For a complete list of Ethics courses, please click here.

2 Minimum grade of C required.

3 Please select any academic course from the Schools of Biological Sciences, Chemistry, Earth and Atmospheric Sciences, or Physics. Research credits may not apply to this requirement.

4 ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

5 The following courses are not allowed: ECE 3710, ECE 3741, HPS 1XXX, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113, and PHYS 2XXX (AP Credit). Maximum of six credit hours of Special Problems or research may be applied toward the degree

6 CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (must be taken for Letter Grade basis)

7 Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

8 No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

9 The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (7)

10 Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Electrical Engineering - Signal & Information Processing and Electronic Devices

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS [1]		6

Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 1211K	Chemical Principles I	
Science Elective [3]		3
Ethics Requirement [1]		
Probability/Statistics [6, 10]		3
Major Requirements		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 2026	Introduction to Signal Processing [2]	3
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
or ECE 2036	Engineering Software Design	
ECE 2040	Circuit Analysis [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
ECE 3025	Electromagnetics [2]	3
ECE 3040	Microelectronic Circuits [2]	4
ECE 3043	Measurements, Circuits, and Microelectronics Laboratory [2]	2
Electronic Devices [2,10]		
ECE 3450	Semiconductor Devices	3
ECE 4452	IC Fabrication	3
Select one of the following: [2,8]		3
ECE 4350	Electromagnetic and Microwave Applications	
ECE 4460	Introduction to Electronic Systems Packaging	
ECE 4470	Devices for Renewable Energy	
ECE 4500	Optical Engineering	
ECE 4751	Laser Theory and Applications	
ECE 4754	Electronics Packaging Assembly, Reliability, Thermal Management, and Test	
ECE 4755	Electronic Packaging Substrate Fabrication	
Electronic Devices Electives		
ECE 3000/4000-level Elective [4]		3
Signal & Information Processing [10]		
Select one of the following: [2,8]		3
ECE 3251	Optimization for Information Systems	
ECE 4270	Fundamentals of Digital Signal Processing	
Select two of the following: [2,8]		6
ECE 3084	Signals and Systems	
ECE 3251	Optimization for Information Systems	
ECE 4122	Advanced Programming Techniques for Engineering Applications	
ECE 4180	Embedded Systems Design	
ECE 4260	Random Signals and Applications	
ECE 4270	Fundamentals of Digital Signal Processing	
ECE 4271	Applications of Digital Signal Processing	
ECE 4273	Design Synthesis of Application-specific Signal Processors	
ECE 4783	Introduction to Medical Image Processing	
Signal & Information Processing Electives		
ECE 3000/4000-level Elective [4]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [7]		3
Free Electives [5,9]		**11**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005.

Courses that are cross-listed with ECE must be taken under the ECE number.

1 Students must complete one Ethics course during their program. For a complete list of Ethics courses, please click here.

2 Minimum grade of C required.

3 Please select any academic course from the Schools of Biological Sciences, Chemistry, Earth and Atmospheric Sciences, or Physics. Research credits may not apply to this requirement.

4 ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

5 The following courses are not allowed: ECE 3710, ECE 3741, HPS 1XXX, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113, and PHYS 2XXX (AP Credit). Maximum of six credit hours of Special Problems or research may be applied toward the degree

6 CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (must be taken for Letter Grade basis)

7 Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

8 No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.

3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[9] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (7)

[10] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Electrical Engineering - Signal & Information Processing and Robotics & Autonomous Systems

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS [1]		6
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Science Elective [3]		3
Ethics Requirement [1]		
Probability/Statistics [6, 10]		3
Major Requirements		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 2026	Introduction to Signal Processing [2]	3
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
or ECE 2036	Engineering Software Design	
ECE 2040	Circuit Analysis [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
ECE 3025	Electromagnetics [2]	3
ECE 3040	Microelectronic Circuits [2]	4
ECE 3043	Measurements, Circuits, and Microelectronics Laboratory [2]	2
Robotics & Autonomous Systems [2,8,10]		
ECE 4550	Control System Design	4
ECE 3550	Feedback Control Systems	3
Select one of the following: [2,8]		3
ECE 3084	Signals and Systems	
ECE 3251	Optimization for Information Systems	
ECE 4560	Introduction to Automation and Robotics	
ECE 4570	System Theory for Communication and Control	
ECE 4580	Computational Computer Vision	
Robotics & Autonomous Systems Electives		
ECE 3000/4000-level Elective [4]		3
Signal & Information Processing [10]		
Select one of the following: [2,8]		3
ECE 3251	Optimization for Information Systems	
ECE 4270	Fundamentals of Digital Signal Processing	
Select two of the following: [2,8]		6
ECE 3084	Signals and Systems	
ECE 3251	Optimization for Information Systems	
ECE 4122	Advanced Programming Techniques for Engineering Applications	
ECE 4180	Embedded Systems Design	
ECE 4260	Random Signals and Applications	
ECE 4270	Fundamentals of Digital Signal Processing	
ECE 4271	Applications of Digital Signal Processing	
ECE 4273	Design Synthesis of Application-specific Signal Processors	
ECE 4783	Introduction to Medical Image Processing	
Signal & Information Processing Electives		
ECE 3000/4000-level Elective [4]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [7]		3
Free Electives [5,9]		**10**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005.

Courses that are cross-listed with ECE must be taken under the ECE number.

[1] Students must complete one Ethics course during their program. For a complete list of Ethics courses, please click here.

[2] Minimum grade of C required.

[3] Please select any academic course from the Schools of Biological Sciences, Chemistry, Earth and Atmospheric Sciences, or Physics. Research credits may not apply to this requirement.

[4] ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

[5] The following courses are not allowed: ECE 3710, ECE 3741, HPS 1XXX, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113, and PHYS 2XXX (AP Credit). Maximum of six credit hours of Special Problems or research may be applied toward the degree

[6] CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (must be taken for Letter Grade basis)

[7] Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

[8] No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[9] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (7)

[10] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Electrical Engineering - Signal & Information Processing and Sensing & Exploration

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS [1]		6
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Science Elective [3]		3
Ethics Requirement [1]		
Probability/Statistics [6, 10]		3
Major Requirements		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 2026	Introduction to Signal Processing [2]	3
ECE 2031	Digital Design Laboratory [2]	2

ECE 2035	Programming for Hardware/Software Systems [2]	4
or ECE 2036	Engineering Software Design	
ECE 2040	Circuit Analysis [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
ECE 3025	Electromagnetics [2]	3
ECE 3040	Microelectronic Circuits [2]	4
ECE 3043	Measurements, Circuits, and Microelectronics Laboratory [2]	2
Signal & Information Processing [10]		
Select one of the following: [2,8]		3
ECE 3251	Optimization for Information Systems	
ECE 4270	Fundamentals of Digital Signal Processing	
Select two of the following: [2,8]		6
ECE 3084	Signals and Systems	
ECE 3251	Optimization for Information Systems	
ECE 4122	Advanced Programming Techniques for Engineering Applications	
ECE 4180	Embedded Systems Design	
ECE 4260	Random Signals and Applications	
ECE 4270	Fundamentals of Digital Signal Processing	
ECE 4271	Applications of Digital Signal Processing	
ECE 4273	Design Synthesis of Application-specific Signal Processors	
ECE 4783	Introduction to Medical Image Processing	
Signal & Information Processing Electives		
ECE 3000/4000-level Elective [4]		3
Sensing & Exploration [2,10]		
ECE 4390	Introduction to Radar and Electromagnetic Sensing	3
Select two of the following: [2,8]		6
ECE 3084	Signals and Systems	
ECE 4260	Random Signals and Applications	
ECE 4350	Electromagnetic and Microwave Applications	
ECE 4360	RF-Microwave Measurement Laboratory	
ECE 4370	Antenna Engineering	
ECE 4580	Computational Computer Vision	
ECE 4781	Biomedical Instrumentation	
Sensing & Exploartion Electives		
ECE 3000/4000-level Elective [4]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [7]		3
Free Electives [5,9]		**11**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005.

Courses that are cross-listed with ECE must be taken under the ECE number.

[1] Students must complete one Ethics course during their program. For a complete list of Ethics courses, please click here.

[2] Minimum grade of C required.

[3] Please select any academic course from the Schools of Biological Sciences, Chemistry, Earth and Atmospheric Sciences, or Physics. Research credits may not apply to this requirement.

[4] ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

[5] The following courses are not allowed: ECE 3710, ECE 3741, HPS 1XXX, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113, and PHYS 2XXX (AP Credit). Maximum of six credit hours of Special Problems or research may be applied toward the degree

[6] CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (must be taken for Letter Grade basis)

[7] Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

[8] No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[9] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (7)

[10] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Electrical Engineering - Signal & Information Processing and Telecommunications

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS [1]		6
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Science Elective [3]		3
Ethics Requirement [1]		
Probability/Statistics [6, 10]		3
Major Requirements		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 2026	Introduction to Signal Processing [2]	3
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
or ECE 2036	Engineering Software Design	
ECE 2040	Circuit Analysis [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
ECE 3025	Electromagnetics [2]	3
ECE 3040	Microelectronic Circuits [2]	4
ECE 3043	Measurements, Circuits, and Microelectronics Laboratory [2]	2
Signal & Information Processing [10]		
Select one of the following: [2,8]		3
ECE 3251	Optimization for Information Systems	
ECE 4270	Fundamentals of Digital Signal Processing	
Select two of the following: [2,8]		6
ECE 3084	Signals and Systems	
ECE 3251	Optimization for Information Systems	
ECE 4122	Advanced Programming Techniques for Engineering Applications	
ECE 4180	Embedded Systems Design	
ECE 4260	Random Signals and Applications	
ECE 4270	Fundamentals of Digital Signal Processing	
ECE 4271	Applications of Digital Signal Processing	
ECE 4273	Design Synthesis of Application-specific Signal Processors	
ECE 4783	Introduction to Medical Image Processing	
Signal & Information Processing Electives		
ECE 3000/4000-level Elective [4]		3
Telecommunications [10]		
Select one of the following: [2,8]		3
ECE 3600	Computer Communications	
CS 3251	Computer Networking I	
Select one of the following: [2,8]		3
ECE 4601	Communication Systems	
ECE 4606	Wireless Communications	
Select one of the following: [2,8]		3
ECE 3084	Signals and Systems	
ECE 4350	Electromagnetic and Microwave Applications	
ECE 4370	Antenna Engineering	
ECE 4500	Optical Engineering	
ECE 4502	Optical Fiber Communications	
ECE 4601	Communication Systems	
ECE 4605	Topics in Networks	
ECE 4606	Wireless Communications	
ECE 4607	Mobile and Wireless Networks	
Telecommunications Electives		
ECE 3000/4000-level Elective [4]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [7]		3
Free Electives [5,9]		**11**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005.

Courses that are cross-listed with ECE must be taken under the ECE number.

[1] Students must complete one Ethics course during their program. For a complete list of Ethics courses, please click here.

[2] Minimum grade of C required.

[3] Please select any academic course from the Schools of Biological Sciences, Chemistry, Earth and Atmospheric Sciences, or Physics. Research credits may not apply to this requirement.

[4] ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

[5] The following courses are not allowed: ECE 3710, ECE 3741, HPS 1XXX, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113, and PHYS 2XXX (AP Credit). Maximum of six credit hours of Special Problems or research may be applied toward the degree

[6] CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (must be taken for Letter Grade basis)

[7] Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

[8] No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[9] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (7)

[10] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Electrical Engineering - Electric Energy Systems and Signal & Information Processing

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS [1]		6
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Science Elective [3]		3
Ethics Requirement [1]		
Probability/Statistics [6, 10]		3
Major Requirements		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 2026	Introduction to Signal Processing [2]	3
ECE 2031	Digital Design Laboratory [2]	2

ECE 2035	Programming for Hardware/Software Systems [2]	4
or ECE 2036	Engineering Software Design	
ECE 2040	Circuit Analysis [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
ECE 3025	Electromagnetics [2]	3
ECE 3040	Microelectronic Circuits [2]	4
ECE 3043	Measurements, Circuits, and Microelectronics Laboratory [2]	2
Electric Energy Systems [2,10]		
ECE 3072	Electrical Energy Systems	3
ECE 3300	Electromechanical and Electromagnetic Energy Conversion	3
Select one of the following: [2,8]		3
ECE 4320	Power System Analysis and Control	
ECE 4321	Power System Engineering	
ECE 4325	Electric Power Quality	
ECE 4330	Power Electronics	
ECE 4335	Electric Machinery Analysis	
Electric Energy Systems Electives		
ECE 3000/4000-level Elective [4]		3
Signal & Information Processing [10]		
Select one of the following: [2,8]		3
ECE 3251	Optimization for Information Systems	
ECE 4270	Fundamentals of Digital Signal Processing	
Select two of the following: [2,8]		6
ECE 3084	Signals and Systems	
ECE 3251	Optimization for Information Systems	
ECE 4122	Advanced Programming Techniques for Engineering Applications	
ECE 4180	Embedded Systems Design	
ECE 4260	Random Signals and Applications	
ECE 4270	Fundamentals of Digital Signal Processing	
ECE 4271	Applications of Digital Signal Processing	
ECE 4273	Design Synthesis of Application-specific Signal Processors	
ECE 4783	Introduction to Medical Image Processing	
Signal & Information Processing Electives		
ECE 3000/4000-level Elective [4]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [7]		3
Free Electives [5,9]		**11**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005.

Courses that are cross-listed with ECE must be taken under the ECE number.

1 Students must complete one Ethics course during their program. For a complete list of Ethics courses, please click here.

2 Minimum grade of C required.

3 Please select any academic course from the Schools of Biological Sciences, Chemistry, Earth and Atmospheric Sciences, or Physics. Research credits may not apply to this requirement.

4 ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

5 The following courses are not allowed: ECE 3710, ECE 3741, HPS 1XXX, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113, and PHYS 2XXX (AP Credit). Maximum of six credit hours of Special Problems or research may be applied toward the degree

6 CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (must be taken for Letter Grade basis)

7 Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

8 No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

9 The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (7)

10 Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Electrical Engineering - Robotics & Autonomous Systems and Electric Energy Systems

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS [1]		6
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Science Elective [3]		3
Ethics Requirement [1]		
Probability/Statistics [6, 10]		3
Major Requirements		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 2026	Introduction to Signal Processing [2]	3
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
or ECE 2036	Engineering Software Design	
ECE 2040	Circuit Analysis [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
ECE 3025	Electromagnetics [2]	3
ECE 3040	Microelectronic Circuits [2]	4
ECE 3043	Measurements, Circuits, and Microelectronics Laboratory [2]	2
Electric Energy Systems [2,10]		
ECE 3072	Electrical Energy Systems	3
ECE 3300	Electromechanical and Electromagnetic Energy Conversion	3
Select one of the following: [2,8]		3
ECE 4320	Power System Analysis and Control	
ECE 4321	Power System Engineering	
ECE 4325	Electric Power Quality	
ECE 4330	Power Electronics	
ECE 4335	Electric Machinery Analysis	
Electric Energy Systems Electives		
ECE 3000/4000-level Elective [4]		3
Robotics & Autonomous Systems [10]		
ECE 4550	Control System Design	4
ECE 3550	Feedback Control Systems	3
Select one of the following: [2,8]		3
ECE 3084	Signals and Systems	
ECE 3251	Optimization for Information Systems	
ECE 4560	Introduction to Automation and Robotics	
ECE 4570	System Theory for Communication and Control	
ECE 4580	Computational Computer Vision	
Robotics & Autonomous Systems Electives		
ECE 3000/4000-level Elective [4]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [7]		3
Free Electives [5,9]		**10**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005.

Courses that are cross-listed with ECE must be taken under the ECE number.

1. Students must complete one Ethics course during their program. For a complete list of Ethics courses, please click here.
2. Minimum grade of C required.
3. Please select any academic course from the Schools of Biological Sciences, Chemistry, Earth and Atmospheric Sciences, or Physics. Research credits may not apply to this requirement.
4. ECE electives are subject to School approval and must satisfy the following constraints:
   1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).

2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

[5] The following courses are not allowed: ECE 3710, ECE 3741, HPS 1XXX, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113, and PHYS 2XXX (AP Credit). Maximum of six credit hours of Special Problems or research may be applied toward the degree

[6] CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (must be taken for Letter Grade basis)

[7] Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

[8] No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[9] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (7)

[10] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Electrical Engineering - Robotics & Autonomous Systems and Bioengineering

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS [1]		6
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Science Elective [3]		3
Ethics Requirement [1]		
Probability/Statistics [6, 10]		3
Major Requirements		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 2026	Introduction to Signal Processing [2]	3
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
or ECE 2036	Engineering Software Design	
ECE 2040	Circuit Analysis [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
ECE 3025	Electromagnetics [2]	3
ECE 3040	Microelectronic Circuits [2]	4
ECE 3043	Measurements, Circuits, and Microelectronics Laboratory [2]	2
Bioengineering [10]		
Select one of the following: [2,8]		3
ECE 4781	Biomedical Instrumentation [3]	
ECE 4782	Biosystems Analysis [3]	
ECE 4784	Engineering Electrophysiology [3]	
Select two of the following: [2,8]		6
ECE 3084	Signals and Systems	

ECE 4350	Electromagnetic and Microwave Applications	
ECE 4370	Antenna Engineering	
ECE 4435	Operational Amplifier Design	
ECE 4781	Biomedical Instrumentation	
ECE 4782	Biosystems Analysis	
ECE 4784	Engineering Electrophysiology	
Bioengineering Electives		
ECE 3000/4000-level Elective [4]		3
Robotics & Autonomous Systems [10]		
ECE 3550	Feedback Control Systems	3
ECE 4550	Control System Design	4
Select one of the following: [2,8]		3
ECE 3084	Signals and Systems	
ECE 3251	Optimization for Information Systems	
ECE 4560	Introduction to Automation and Robotics	
ECE 4570	System Theory for Communication and Control	
ECE 4580	Computational Computer Vision	
Robotics & Autonomous Systems Electives		
ECE 3000/4000-level Elective [4]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [7]		3
Free Electives [5,9]		**10**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005.

Courses that are cross-listed with ECE must be taken under the ECE number.

1 Students must complete one Ethics course during their program. For a complete list of Ethics courses, please click here.

2 Minimum grade of C required.

3 Please select any academic course from the Schools of Biological Sciences, Chemistry, Earth and Atmospheric Sciences, or Physics. Research credits may not apply to this requirement.

4 ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

5 The following courses are not allowed: ECE 3710, ECE 3741, HPS 1XXX, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113, and PHYS 2XXX (AP Credit). Maximum of six credit hours of Special Problems or research may be applied toward the degree

6 CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (must be taken for Letter Grade basis)

7 Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

8 No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

9 The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (7)

10 Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Electrical Engineering - Robotics & Autonomous Systems and Circuit Technology

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	

INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS [1]		6
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 1211	Chemical Principles I	
Science Elective [3]		3
Ethics Requirement [1]		
Probability/Statistics [6, 10]		3
Major Requirements		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 2026	Introduction to Signal Processing [2]	3
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
or ECE 2036	Engineering Software Design	
ECE 2040	Circuit Analysis [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
ECE 3025	Electromagnetics [2]	3
ECE 3040	Microelectronic Circuits [2]	4
ECE 3043	Measurements, Circuits, and Microelectronics Laboratory [2]	2
Circuit Technology [10]		
ECE 3400	Analog Electronics	3
ECE 4452	IC Fabrication	3
Select one of the following: [2,8]		3
ECE 4043	Senior Analog Electronics Laboratory	
ECE 4415	RF Engineering I	
ECE 4420	Digital Integrated Circuits	
ECE 4430	Analog Integrated Circuits	
ECE 4435	Operational Amplifier Design	
ECE 4502	Optical Fiber Communications	
ECE 4370	Antenna Engineering	
ECE 4391	Electromagnetic Compatibility	
Circuit Technology Electives		
ECE 3000/4000-level Elective [4]		3
Robotics & Autonomous Systems [10]		
ECE 3550	Feedback Control Systems	3
ECE 4550	Control System Design	4
Select one of the following: [2,8]		3
ECE 3084	Signals and Systems	
ECE 3251	Optimization for Information Systems	
ECE 4560	Introduction to Automation and Robotics	
ECE 4570	System Theory for Communication and Control	
ECE 4580	Computational Computer Vision	
Robotics & Autonomous Systems Electives		
ECE 3000/4000-level Elective [4]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [7]		3
Free Electives [5,9]		**10**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005.

Courses that are cross-listed with ECE must be taken under the ECE number.

1 Students must complete one Ethics course during their program. For a complete list of Ethics courses, please click here.

2 Minimum grade of C required.

3 Please select any academic course from the Schools of Biological Sciences, Chemistry, Earth and Atmospheric Sciences, or Physics. Research credits may not apply to this requirement.

4 ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

5 The following courses are not allowed: ECE 3710, ECE 3741, HPS 1XXX, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113, and PHYS 2XXX (AP Credit). Maximum of six credit hours of Special Problems or research may be applied toward the degree

6 CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (must be taken for Letter Grade basis)

7 Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

8 No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).

2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[9] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (7)

[10] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Electrical Engineering - Robotics & Autonomous Systems and Electronic Devices

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS [1]		6
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Science Elective [3]		3
Ethics Requirement [1]		
Probability/Statistics [6, 10]		3
Major Requirements		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 2026	Introduction to Signal Processing [2]	3
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
or ECE 2036	Engineering Software Design	
ECE 2040	Circuit Analysis [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
ECE 3025	Electromagnetics [2]	3
ECE 3040	Microelectronic Circuits [2]	4
ECE 3043	Measurements, Circuits, and Microelectronics Laboratory [2]	2
Electronic Devices [2,10]		
ECE 3450	Semiconductor Devices	3
ECE 4452	IC Fabrication	3
Select one of the following: [2,8]		3
ECE 4350	Electromagnetic and Microwave Applications	
ECE 4460	Introduction to Electronic Systems Packaging	
ECE 4470	Devices for Renewable Energy	
ECE 4500	Optical Engineering	
ECE 4751	Laser Theory and Applications	
ECE 4754	Electronics Packaging Assembly, Reliability, Thermal Management, and Test	
ECE 4755	Electronic Packaging Substrate Fabrication	
Electronic Devices Electives		
ECE 3000/4000-level Elective [4]		3
Robotics & Autonomous Systems [10]		
ECE 3550	Feedback Control Systems	3
ECE 4550	Control System Design	4
Select one of the following: [2,8]		3
ECE 3084	Signals and Systems	
ECE 3251	Optimization for Information Systems	
ECE 4560	Introduction to Automation and Robotics	
ECE 4570	System Theory for Communication and Control	
ECE 4580	Computational Computer Vision	
Robotics & Autonomous Systems Electives		
ECE 3000/4000-level Elective [4]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [7]		3
Free Electives [5,9]		**10**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005.

Courses that are cross-listed with ECE must be taken under the ECE number.

[1] Students must complete one Ethics course during their program. For a complete list of Ethics courses, please click here.

[2] Minimum grade of C required.

[3] Please select any academic course from the Schools of Biological Sciences, Chemistry, Earth and Atmospheric Sciences, or Physics. Research credits may not apply to this requirement.

[4] ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

[5] The following courses are not allowed: ECE 3710, ECE 3741, HPS 1XXX, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113, and PHYS 2XXX (AP Credit). Maximum of six credit hours of Special Problems or research may be applied toward the degree

[6] CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (must be taken for Letter Grade basis)

[7] Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

[8] No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[9] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (7)

[10] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Electrical Engineering - Robotics & Autonomous Systems and Sensing & Exploration

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS [1]		6
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Science Elective [3]		3
Ethics Requirement [1]		
Probability/Statistics [6, 10]		3
Major Requirements		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 2026	Introduction to Signal Processing [2]	3
ECE 2031	Digital Design Laboratory [2]	2

ECE 2035	Programming for Hardware/Software Systems [2]	4
or ECE 2036	Engineering Software Design	
ECE 2040	Circuit Analysis [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
ECE 3025	Electromagnetics [2]	3
ECE 3040	Microelectronic Circuits [2]	4
ECE 3043	Measurements, Circuits, and Microelectronics Laboratory [2]	2
Robotics & Autonomous Systems [10]		
ECE 4550	Control System Design	4
ECE 3550	Feedback Control Systems	3
Select one of the following: [2,8]		3
ECE 3084	Signals and Systems	
ECE 3251	Optimization for Information Systems	
ECE 4560	Introduction to Automation and Robotics	
ECE 4570	System Theory for Communication and Control	
ECE 4580	Computational Computer Vision	
Robotics & Autonomous Systems Electives		
ECE 3000/4000-level Elective [4]		3
Sensing & Exploration [2,10]		
ECE 4390	Introduction to Radar and Electromagnetic Sensing	3
Select two of the following: [2,8]		6
ECE 3084	Signals and Systems	
ECE 4260	Random Signals and Applications	
ECE 4350	Electromagnetic and Microwave Applications	
ECE 4360	RF-Microwave Measurement Laboratory	
ECE 4370	Antenna Engineering	
ECE 4580	Computational Computer Vision	
ECE 4781	Biomedical Instrumentation	
Sensing & Exploration Electives		
ECE 3000/4000-level Elective [4]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [7]		3
Free Electives [5,9]		**10**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005.

Courses that are cross-listed with ECE must be taken under the ECE number.

1 Students must complete one Ethics course during their program. For a complete list of Ethics courses, please click here.

2 Minimum grade of C required.

3 Please select any academic course from the Schools of Biological Sciences, Chemistry, Earth and Atmospheric Sciences, or Physics. Research credits may not apply to this requirement.

4 ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

5 The following courses are not allowed: ECE 3710, ECE 3741, HPS 1XXX, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113, and PHYS 2XXX (AP Credit). Maximum of six credit hours of Special Problems or research may be applied toward the degree

6 CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (must be taken for Letter Grade basis)

7 Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

8 No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

9 The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (7)

10 Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Electrical Engineering - Robotics & Autonomous Systems and Telecommunications

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3

ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS [1]		6
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 1210	Chemical Principles I	
Science Elective [3]		3
Ethics Requirement [1]		
Probability/Statistics [6, 10]		3
Major Requirements		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 2026	Introduction to Signal Processing [2]	3
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
or ECE 2036	Engineering Software Design	
ECE 2040	Circuit Analysis [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
ECE 3025	Electromagnetics [2]	3
ECE 3040	Microelectronic Circuits [2]	4
ECE 3043	Measurements, Circuits, and Microelectronics Laboratory [2]	2
Robotics & Autonomous Systems [10]		
ECE 4550	Control System Design	4
ECE 3550	Feedback Control Systems	3
Select one of the following: [2,8]		3
ECE 3084	Signals and Systems	
ECE 3251	Optimization for Information Systems	
ECE 4560	Introduction to Automation and Robotics	
ECE 4570	System Theory for Communication and Control	
ECE 4580	Computational Computer Vision	
Robotics & Autonomous Systems Electives		
ECE 3000/4000-level Elective [4]		3
Telecommunications [10]		
Select one of the following: [2,8]		3
ECE 3600	Computer Communications	
CS 3251	Computer Networking I	
Select one of the following: [2,8]		3
ECE 4601	Communication Systems	
ECE 4606	Wireless Communications	
Select one of the following: [2,8]		3
ECE 3084	Signals and Systems	
ECE 4350	Electromagnetic and Microwave Applications	
ECE 4370	Antenna Engineering	
ECE 4500	Optical Engineering	
ECE 4502	Optical Fiber Communications	
ECE 4601	Communication Systems	
ECE 4605	Topics in Networks	
ECE 4606	Wireless Communications	
ECE 4607	Mobile and Wireless Networks	
Telecommunications Electives		
ECE 3000/4000-level Elective [4]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [7]		3
Free Electives [5,9]		**10**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005.

Courses that are cross-listed with ECE must be taken under the ECE number.

[1] Students must complete one Ethics course during their program. For a complete list of Ethics courses, please click here.

[2] Minimum grade of C required.

[3] Please select any academic course from the Schools of Biological Sciences, Chemistry, Earth and Atmospheric Sciences, or Physics. Research credits may not apply to this requirement.

[4] ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

[5] The following courses are not allowed: ECE 3710, ECE 3741, HPS 1XXX, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113, and PHYS

2XXX (AP Credit). Maximum of six credit hours of Special Problems or research may be applied toward the degree

[6] CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (must be taken for Letter Grade basis)

[7] Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

[8] No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[9] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (7)

Bachelor of Science in Electrical Engineering - Electric Energy Systems and Telecommunications

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS [1]		6
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Science Elective [3]		3
Ethics Requirement [1]		
Probability/Statistics [6, 10]		3
Major Requirements		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 2026	Introduction to Signal Processing [2]	3
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
or ECE 2036	Engineering Software Design	
ECE 2040	Circuit Analysis [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
ECE 3025	Electromagnetics [2]	3
ECE 3040	Microelectronic Circuits [2]	4
ECE 3043	Measurements, Circuits, and Microelectronics Laboratory [2]	2
Electric Energy Systems [2,10]		
ECE 3072	Electrical Energy Systems	3
ECE 3300	Electromechanical and Electromagnetic Energy Conversion	3
Select one of the following: [2,8]		3
ECE 4320	Power System Analysis and Control	
ECE 4321	Power System Engineering	
ECE 4325	Electric Power Quality	
ECE 4330	Power Electronics	
ECE 4335	Electric Machinery Analysis	
Electric Energy Systems Electives		
ECE 3000/4000-level Elective [4]		3
Telecommunications [10]		
Select one of the following: [2,8]		3
ECE 3600	Computer Communications	
CS 3251	Computer Networking I	
Select one of the following: [2,8]		3

ECE 4601	Communication Systems	
ECE 4606	Wireless Communications	
Select one of the following: [2,8]		3
ECE 3084	Signals and Systems	
ECE 4350	Electromagnetic and Microwave Applications	
ECE 4370	Antenna Engineering	
ECE 4500	Optical Engineering	
ECE 4502	Optical Fiber Communications	
ECE 4601	Communication Systems	
ECE 4605	Topics in Networks	
ECE 4606	Wireless Communications	
ECE 4607	Mobile and Wireless Networks	
Telecommunications Electives		
ECE 3000/4000-level Elective [4]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [7]		3
Free Electives [5,9]		**11**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005.

Courses that are cross-listed with ECE must be taken under the ECE number.

1 Students must complete one Ethics course during their program. For a complete list of Ethics courses, please click here.

2 Minimum grade of C required.

3 Please select any academic course from the Schools of Biological Sciences, Chemistry, Earth and Atmospheric Sciences, or Physics. Research credits may not apply to this requirement.

4 ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

5 The following courses are not allowed: ECE 3710, ECE 3741, HPS 1XXX, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113, and PHYS 2XXX (AP Credit). Maximum of six credit hours of Special Problems or research may be applied toward the degree

6 CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (must be taken for Letter Grade basis)

7 Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

8 No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

9 The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (7)

10 Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Electrical Engineering - Sensing & Exploration and Telecommunications

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	

ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS [1]		6
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 1211	Chemical Principles I	
Science Elective [3]		3
Ethics Requirement [1]		
Probability/Statistics [6, 10]		3
Major Requirements		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 2026	Introduction to Signal Processing [2]	3
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
or ECE 2036	Engineering Software Design	
ECE 2040	Circuit Analysis [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
ECE 3025	Electromagnetics [2]	3
ECE 3040	Microelectronic Circuits [2]	4
ECE 3043	Measurements, Circuits, and Microelectronics Laboratory [2]	2
Telecommunications [10]		
Select one of the following: [2,8]		3
ECE 3600	Computer Communications	
CS 3251	Computer Networking I	
Select one of the following: [2,8]		3
ECE 4601	Communication Systems	
ECE 4606	Wireless Communications	
Select one of the following: [2,8]		3
ECE 3084	Signals and Systems	
ECE 4350	Electromagnetic and Microwave Applications	
ECE 4370	Antenna Engineering	
ECE 4500	Optical Engineering	
ECE 4502	Optical Fiber Communications	
ECE 4601	Communication Systems	
ECE 4605	Topics in Networks	
ECE 4606	Wireless Communications	
ECE 4607	Mobile and Wireless Networks	
Telecommunications Electives		
ECE 3000/4000-level Elective [4]		3
Sensing & Exploration [2,10]		
ECE 4390	Introduction to Radar and Electromagnetic Sensing	3
Select two of the following: [2,8]		6
ECE 3084	Signals and Systems	
ECE 4260	Random Signals and Applications	
ECE 4350	Electromagnetic and Microwave Applications	
ECE 4360	RF-Microwave Measurement Laboratory	
ECE 4370	Antenna Engineering	
ECE 4580	Computational Computer Vision	
ECE 4781	Biomedical Instrumentation	
Sensing & Exploration Electives		
ECE 3000/4000-level Elective [4]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [7]		3
Free Electives [5,9]		**11**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005.

Courses that are cross-listed with ECE must be taken under the ECE number.

1 Students must complete one Ethics course during their program. For a complete list of Ethics courses, please click here.

2 Minimum grade of C required.

3 Please select any academic course from the Schools of Biological Sciences, Chemistry, Earth and Atmospheric Sciences, or Physics. Research credits may not apply to this requirement.

4 ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

5 The following courses are not allowed: ECE 3710, ECE 3741, HPS 1XXX, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113, and PHYS 2XXX (AP Credit). Maximum of six credit hours of Special Problems or research may be applied toward the degree

6 CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (must be taken for Letter Grade basis)

7 Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

8 No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).

2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[9] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (7)

[10] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Electrical Engineering - Bioengineering and Telecommunications

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS [1]		6
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Science Elective [3]		3
Ethics Requirement [1]		
Probability/Statistics [6, 10]		3
Major Requirements		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 2026	Introduction to Signal Processing [2]	3
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
or ECE 2036	Engineering Software Design	
ECE 2040	Circuit Analysis [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
ECE 3025	Electromagnetics [2]	3
ECE 3040	Microelectronic Circuits [2]	4
ECE 3043	Measurements, Circuits, and Microelectronics Laboratory [2]	2
Bioengineering [10]		
Select one of the following: [2,8]		3
ECE 4781	Biomedical Instrumentation [3]	
ECE 4782	Biosystems Analysis [3]	
ECE 4784	Engineering Electrophysiology [3]	
Select two of the following: [2,8]		6
ECE 3084	Signals and Systems	
ECE 4350	Electromagnetic and Microwave Applications	
ECE 4370	Antenna Engineering	
ECE 4435	Operational Amplifier Design	
ECE 4781	Biomedical Instrumentation	
ECE 4782	Biosystems Analysis	
ECE 4784	Engineering Electrophysiology	
Bioengineering Electives		
ECE 3000/4000-level Elective [4]		3
Telecommunications [10]		
Select one of the following: [2,8]		3
ECE 3600	Computer Communications	
CS 3251	Computer Networking I	
Select one of the following: [2,8]		3
ECE 4601	Communication Systems	
ECE 4606	Wireless Communications	
Select one of the following: [2,8]		3
ECE 3084	Signals and Systems	
ECE 4350	Electromagnetic and Microwave Applications	
ECE 4370	Antenna Engineering	
ECE 4500	Optical Engineering	
ECE 4502	Optical Fiber Communications	
ECE 4601	Communication Systems	
ECE 4605	Topics in Networks	
ECE 4606	Wireless Communications	
ECE 4607	Mobile and Wireless Networks	
Telecommunications Electives		
ECE 3000/4000-level Elective [4]		3

Culminating Senior Design Options (Capstone)	
Culminating Senior Design [7]	3
Free Electives [5,9]	**11**
Total Credit Hours	**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005.

Courses that are cross-listed with ECE must be taken under the ECE number.

1 Students must complete one Ethics course during their program. For a complete list of Ethics courses, please click here.

2 Minimum grade of C required.

3 Please select any academic course from the Schools of Biological Sciences, Chemistry, Earth and Atmospheric Sciences, or Physics. Research credits may not apply to this requirement.

4 ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

5 The following courses are not allowed: ECE 3710, ECE 3741, HPS 1XXX, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113, and PHYS 2XXX (AP Credit). Maximum of six credit hours of Special Problems or research may be applied toward the degree

6 CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (must be taken for Letter Grade basis)

7 Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

8 No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

9 The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (7)

10 Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Electrical Engineering - Electronic Devices and Telecommunications

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS [1]		6
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Science Elective [3]		3
Ethics Requirement [1]		
Probability/Statistics [6, 10]		3
Major Requirements		

ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 2026	Introduction to Signal Processing [2]	3
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
or ECE 2036	Engineering Software Design	
ECE 2040	Circuit Analysis [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
ECE 3025	Electromagnetics [2]	3
ECE 3040	Microelectronic Circuits [2]	4
ECE 3043	Measurements, Circuits, and Microelectronics Laboratory [2]	2
Electronic Devices [2,10]		
ECE 3450	Semiconductor Devices	3
ECE 4452	IC Fabrication	3
Select one of the following: [2,8]		3
ECE 4350	Electromagnetic and Microwave Applications	
ECE 4460	Introduction to Electronic Systems Packaging	
ECE 4470	Devices for Renewable Energy	
ECE 4500	Optical Engineering	
ECE 4751	Laser Theory and Applications	
ECE 4754	Electronics Packaging Assembly, Reliability, Thermal Management, and Test	
ECE 4755	Electronic Packaging Substrate Fabrication	
Electronic Devices Electives		
ECE 3000/4000-level Elective [4]		3
Telecommunications [2,10]		
Select one of the following: [2,8]		3
ECE 3600	Computer Communications	
CS 3251	Computer Networking I	
Select one of the following: [2,8]		3
ECE 4601	Communication Systems	
ECE 4606	Wireless Communications	
Select one of the following: [2,8]		3
ECE 3084	Signals and Systems	
ECE 4350	Electromagnetic and Microwave Applications	
ECE 4370	Antenna Engineering	
ECE 4500	Optical Engineering	
ECE 4601	Communication Systems	
ECE 4605	Topics in Networks	
ECE 4606	Wireless Communications	
ECE 4607	Mobile and Wireless Networks	
Telecommunications Electives		
ECE 3000/4000-level Elective [4]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [7]		3
Free Electives [5,9]		**11**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005.

Courses that are cross-listed with ECE must be taken under the ECE number.

1 Students must complete one Ethics course during their program. For a complete list of Ethics courses, please click here.

2 Minimum grade of C required.

3 Please select any academic course from the Schools of Biological Sciences, Chemistry, Earth and Atmospheric Sciences, or Physics. Research credits may not apply to this requirement.

4 ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

5 The following courses are not allowed: ECE 3710, ECE 3741, HPS 1XXX, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113, and PHYS 2XXX (AP Credit). Maximum of six credit hours of Special Problems or research may be applied toward the degree

6 CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (must be taken for Letter Grade basis)

7 Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

8 No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

9 The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (7)

10 Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Electrical Engineeering - Electronic Devices and Sensing & Exploration

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS [1]		6
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Science Elective [3]		3
Ethics Requirement [1]		
Probability/Statistics [6, 10]		3
Major Requirements		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 2026	Introduction to Signal Processing [2]	3
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
or ECE 2036	Engineering Software Design	
ECE 2040	Circuit Analysis [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
ECE 3025	Electromagnetics [2]	3
ECE 3040	Microelectronic Circuits [2]	4
ECE 3043	Measurements, Circuits, and Microelectronics Laboratory [2]	2
Electronic Devices [2,10]		
ECE 3450	Semiconductor Devices	3
ECE 4452	IC Fabrication	3
Select one of the following: [2,8]		3
ECE 4350	Electromagnetic and Microwave Applications	
ECE 4460	Introduction to Electronic Systems Packaging	
ECE 4470	Devices for Renewable Energy	
ECE 4500	Optical Engineering	
ECE 4751	Laser Theory and Applications	
ECE 4754	Electronics Packaging Assembly, Reliability, Thermal Management, and Test	
ECE 4755	Electronic Packaging Substrate Fabrication	
Electronic Devices Electives		
ECE 3000/4000-level Elective [4]		3
Sensing & Exploration [10]		
ECE 4390	Introduction to Radar and Electromagnetic Sensing	3
Select two of the following: [2,8]		6
ECE 3084	Signals and Systems	
ECE 4260	Random Signals and Applications	
ECE 4350	Electromagnetic and Microwave Applications	
ECE 4360	RF-Microwave Measurement Laboratory	
ECE 4370	Antenna Engineering	
ECE 4580	Computational Computer Vision	
ECE 4781	Biomedical Instrumentation	
Sensing & Exploration Electives		
ECE 3000/4000-level Elective [4]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [7]		3
Free Electives [5,9]		**11**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005.

Courses that are cross-listed with ECE must be taken under the ECE number.

1. Students must complete one Ethics course during their program. For a complete list of Ethics courses, please click here.
2. Minimum grade of C required.
3. Please select any academic course from the Schools of Biological Sciences, Chemistry, Earth and Atmospheric Sciences, or Physics. Research credits may not apply to this requirement.
4. ECE electives are subject to School approval and must satisfy the following constraints:
   1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals

Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).

2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

[5] The following courses are not allowed: ECE 3710, ECE 3741, HPS 1XXX, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113, and PHYS 2XXX (AP Credit). Maximum of six credit hours of Special Problems or research may be applied toward the degree

[6] CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (must be taken for Letter Grade basis)

[7] Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

[8] No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[9] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (7)

[10] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Electrical Engineering - Electronic Devices and Circuit Technology

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS [1]		6
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Science Elective [3]		3
Ethics Requirement [1]		
Probability/Statistics [6,10]		3
Major Requirements		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 2026	Introduction to Signal Processing [2]	3
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
or ECE 2036	Engineering Software Design	
ECE 2040	Circuit Analysis [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
ECE 3025	Electromagnetics [2]	3
ECE 3040	Microelectronic Circuits [2]	4
ECE 3043	Measurements, Circuits, and Microelectronics Laboratory [2]	2
Circuit Technology [10]		
ECE 3400	Analog Electronics	3
ECE 4452	IC Fabrication	3
Select one of the following: [2,8]		3
ECE 4043	Senior Analog Electronics Laboratory	
ECE 4415	RF Engineering I	

ECE 4420	Digital Integrated Circuits	
ECE 4430	Analog Integrated Circuits	
ECE 4435	Operational Amplifier Design	
ECE 4502	Optical Fiber Communications	
ECE 4370	Antenna Engineering	
ECE 4391	Electromagnetic Compatibility	
Circuit Technology Electives		
ECE 3000/4000-level Elective [4]		3
Electronic Devices [2,10]		
ECE 3450	Semiconductor Devices	3
ECE 4452	IC Fabrication	3
Select one of the following: [2,8]		3
ECE 4350	Electromagnetic and Microwave Applications	
ECE 4460	Introduction to Electronic Systems Packaging	
ECE 4470	Devices for Renewable Energy	
ECE 4751	Laser Theory and Applications	
ECE 4754	Electronics Packaging Assembly, Reliability, Thermal Management, and Test	
ECE 4755	Electronic Packaging Substrate Fabrication	
Electronic Devices Electives		
ECE 3000/4000-level Elective [4]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [7]		3
Free Electives [5,9]		**11**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005.

Courses that are cross-listed with ECE must be taken under the ECE number.

1 Students must complete one Ethics course during their program. For a complete list of Ethics courses, please click here.

2 Minimum grade of C required.

3 Please select any academic course from the Schools of Biological Sciences, Chemistry, Earth and Atmospheric Sciences, or Physics. Research credits may not apply to this requirement.

4 ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

5 The following courses are not allowed: ECE 3710, ECE 3741, HPS 1XXX, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113, and PHYS 2XXX (AP Credit). Maximum of six credit hours of Special Problems or research may be applied toward the degree

6 CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (must be taken for Letter Grade basis)

7 Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

8 No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

9 The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (7)

10 Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Electrical Engineering - Electronic Devices and Bioengineering

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	

INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS [1]		6
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 1211	Chemical Principles I	
Science Elective [3]		3
Ethics Requirement [1]		
Probability/Statistics [6,10]		3
Major Requirements		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 2026	Introduction to Signal Processing [2]	3
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
or ECE 2036	Engineering Software Design	
ECE 2040	Circuit Analysis [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
ECE 3025	Electromagnetics [2]	3
ECE 3040	Microelectronic Circuits [2]	4
ECE 3043	Measurements, Circuits, and Microelectronics Laboratory [2]	2
Bioengineering [10]		
Select one of the following: [2,8]		3
ECE 4781	Biomedical Instrumentation [3]	
ECE 4782	Biosystems Analysis [3]	
ECE 4784	Engineering Electrophysiology [3]	
Select two of the following: [2,8]		6
ECE 3084	Signals and Systems	
ECE 4350	Electromagnetic and Microwave Applications	
ECE 4370	Antenna Engineering	
ECE 4435	Operational Amplifier Design	
ECE 4781	Biomedical Instrumentation	
ECE 4782	Biosystems Analysis	
ECE 4784	Engineering Electrophysiology	
Bioengineering Electives		
ECE 3000/4000-level Elective [4]		3
Electronic Devices [2,10]		
ECE 3450	Semiconductor Devices	3
ECE 4452	IC Fabrication	3
Select one of the following: [2,8]		3
ECE 4350	Electromagnetic and Microwave Applications	
ECE 4460	Introduction to Electronic Systems Packaging	
ECE 4470	Devices for Renewable Energy	
ECE 4500	Optical Engineering	
ECE 4751	Laser Theory and Applications	
ECE 4754	Electronics Packaging Assembly, Reliability, Thermal Management, and Test	
ECE 4755	Electronic Packaging Substrate Fabrication	
Electronic Devices Electives		
ECE 3000/4000-level Elective [4]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [7]		3
Free Electives [5,9]		**11**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005.

Courses that are cross-listed with ECE must be taken under the ECE number.

1 Students must complete one Ethics course during their program. For a complete list of Ethics courses, please click here.

2 Minimum grade of C required.

3 Please select any academic course from the Schools of Biological Sciences, Chemistry, Earth and Atmospheric Sciences, or Physics. Research credits may not apply to this requirement.

4 ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

5 The following courses are not allowed: ECE 3710, ECE 3741, HPS 1XXX, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113, and PHYS 2XXX (AP Credit). Maximum of six credit hours of Special Problems or research may be applied toward the degree

6 CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (must be taken for Letter Grade basis)

7 Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

8 No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by

an equivalent number of ECE 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).

2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

9 The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (7)

10 Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Electrical Engineering - Electric Energy Systems and Electronic Devices

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS [1]		6
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Science Elective [3]		3
Ethics Requirement [1]		
Probability/Statistics [6, 10]		3
Major Requirements		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 2026	Introduction to Signal Processing [2]	3
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
or ECE 2036	Engineering Software Design	
ECE 2040	Circuit Analysis [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
ECE 3025	Electromagnetics [2]	3
ECE 3040	Microelectronic Circuits [2]	4
ECE 3043	Measurements, Circuits, and Microelectronics Laboratory [2]	2
Electronic Devices [2,10]		
ECE 3450	Semiconductor Devices	3
ECE 4452	IC Fabrication	3
Select one of the following: [2,8]		3
ECE 4350	Electromagnetic and Microwave Applications	
ECE 4460	Introduction to Electronic Systems Packaging	
ECE 4470	Devices for Renewable Energy	
ECE 4500	Optical Engineering	
ECE 4751	Laser Theory and Applications	
ECE 4754	Electronics Packaging Assembly, Reliability, Thermal Management, and Test	
ECE 4755	Electronic Packaging Substrate Fabrication	
Electronic Devices Electives		
ECE 3000/4000-level Elective [4]		3
Electric Energy Systems [2,10]		
ECE 3072	Electrical Energy Systems	3
ECE 3300	Electromechanical and Electromagnetic Energy Conversion	3
Select one of the following: [2,8]		3
ECE 4320	Power System Analysis and Control	
ECE 4321	Power System Engineering	
ECE 4325	Electric Power Quality	
ECE 4330	Power Electronics	
ECE 4335	Electric Machinery Analysis	
Electric Energy Systems Electives		
ECE 3000/4000-level Elective [4]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [7]		3
Free Electives [5,9]		**11**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005.

Courses that are cross-listed with ECE must be taken under the ECE number.

[1] Students must complete one Ethics course during their program. For a complete list of Ethics courses, please click here.

[2] Minimum grade of C required.

[3] Please select any academic course from the Schools of Biological Sciences, Chemistry, Earth and Atmospheric Sciences, or Physics. Research credits may not apply to this requirement.

[4] ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

[5] The following courses are not allowed: ECE 3710, ECE 3741, HPS 1XXX, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113, and PHYS 2XXX (AP Credit). Maximum of six credit hours of Special Problems or research may be applied toward the degree

[6] CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (must be taken for Letter Grade basis)

[7] Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

[8] No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[9] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (7)

[10] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Electrical Engineering - Circuit Technology and Bioengineering

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS [1]		6
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Science Elective [3]		3
Ethics Requirement [1]		
Probability/Statistics [6, 10]		3
Major Requirements		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 2026	Introduction to Signal Processing [2]	3
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4

or ECE 2036	Engineering Software Design	
ECE 2040	Circuit Analysis [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
ECE 3025	Electromagnetics [2]	3
ECE 3040	Microelectronic Circuits [2]	4
ECE 3043	Measurements, Circuits, and Microelectronics Laboratory [2]	2
Bioengineering [10]		
Select one of the following: [2,8]		3
ECE 4781	Biomedical Instrumentation [3]	
ECE 4782	Biosystems Analysis [3]	
ECE 4784	Engineering Electrophysiology [3]	
Select two of the following: [2,8]		6
ECE 3084	Signals and Systems	
ECE 4350	Electromagnetic and Microwave Applications	
ECE 4370	Antenna Engineering	
ECE 4435	Operational Amplifier Design	
ECE 4781	Biomedical Instrumentation	
ECE 4782	Biosystems Analysis	
ECE 4784	Engineering Electrophysiology	
Bioengineering Electives		
ECE 3000/4000-level Elective [4]		3
Circuit Technology [2,10]		
ECE 3400	Analog Electronics	3
ECE 4452	IC Fabrication	3
Select one of the following: [2,8]		3
ECE 4043	Senior Analog Electronics Laboratory	
ECE 4415	RF Engineering I	
ECE 4420	Digital Integrated Circuits	
ECE 4430	Analog Integrated Circuits	
ECE 4435	Operational Amplifier Design	
ECE 4502	Optical Fiber Communications	
ECE 4370	Antenna Engineering	
ECE 4391	Electromagnetic Compatibility	
Circuit Technology Electives		
ECE 3000/4000-level Elective [4]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [7]		3
Free Electives [5,9]		**11**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005.

Courses that are cross-listed with ECE must be taken under the ECE number.

1. Students must complete one Ethics course during their program. For a complete list of Ethics courses, please click here.
2. Minimum grade of C required.
3. Please select any academic course from the Schools of Biological Sciences, Chemistry, Earth and Atmospheric Sciences, or Physics. Research credits may not apply to this requirement.
4. ECE electives are subject to School approval and must satisfy the following constraints:
   1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
   2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.
5. The following courses are not allowed: ECE 3710, ECE 3741, HPS 1XXX, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113, and PHYS 2XXX (AP Credit). Maximum of six credit hours of Special Problems or research may be applied toward the degree
6. CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (must be taken for Letter Grade basis)
7. Senior Design requirements may be satisfied in the following ways:
   1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
   2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

   NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)
8. No single course may be used to satisfy requirements in both selected threads.
   1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
   2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
   3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.
9. The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (7)
10. Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Electrical Engineering - Electric Energy Systems and Circuit Technology

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	

Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS [1]		6
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 1211	Chemical Principles I	
Science Elective [3]		3
Ethics Requirement [1]		
Probability/Statistics [6,10]		3
Major Requirements		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 2026	Introduction to Signal Processing [2]	3
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
or ECE 2036	Engineering Software Design	
ECE 2040	Circuit Analysis [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
ECE 3025	Electromagnetics [2]	3
ECE 3040	Microelectronic Circuits [2]	4
ECE 3043	Measurements, Circuits, and Microelectronics Laboratory [2]	2
Circuit Technology [2,10]		
ECE 3400	Analog Electronics	3
ECE 4452	IC Fabrication	3
Select one of the following: [2,8]		3
ECE 4043	Senior Analog Electronics Laboratory	
ECE 4415	RF Engineering I	
ECE 4420	Digital Integrated Circuits	
ECE 4430	Analog Integrated Circuits	
ECE 4435	Operational Amplifier Design	
ECE 4502	Optical Fiber Communications	
ECE 4370	Antenna Engineering	
ECE 4391	Electromagnetic Compatibility	
Circuit Technology Electives		
ECE 3000/4000-level Elective [4]		3
Electric Energy Systems [2,10]		
ECE 3072	Electrical Energy Systems	3
ECE 3300	Electromechanical and Electromagnetic Energy Conversion	3
Select one of the following: [2,8]		3
ECE 4320	Power System Analysis and Control	
ECE 4321	Power System Engineering	
ECE 4325	Electric Power Quality	
ECE 4330	Power Electronics	
ECE 4335	Electric Machinery Analysis	
Electric Energy Systems Electives		
ECE 3000/4000-level Elective [4]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [7]		3
Free Electives [5,9]		**11**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005.

Courses that are cross-listed with ECE must be taken under the ECE number.

1. Students must complete one Ethics course during their program. For a complete list of Ethics courses, please click here.
2. Minimum grade of C required.
3. Please select any academic course from the Schools of Biological Sciences, Chemistry, Earth and Atmospheric Sciences, or Physics. Research credits may not apply to this requirement.
4. ECE electives are subject to School approval and must satisfy the following constraints:
   1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
   2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.
5. The following courses are not allowed: ECE 3710, ECE 3741, HPS 1XXX, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113, and PHYS 2XXX (AP Credit). Maximum of six credit hours of Special Problems or research may be applied toward the degree

[6] CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (must be taken for Letter Grade basis)

[7] Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

[8] No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[9] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (7)

[10] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Electrical Engineering - Electric Energy Systems and Bioengineering

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS [1]		6
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Science Elective [3]		3
Ethics Requirement [1]		
Probability/Statistics [6, 10]		3
Major Requirements		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 2026	Introduction to Signal Processing [2]	3
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
or ECE 2036	Engineering Software Design	
ECE 2040	Circuit Analysis [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
ECE 3025	Electromagnetics [2]	3
ECE 3040	Microelectronic Circuits [2]	4
ECE 3043	Measurements, Circuits, and Microelectronics Laboratory [2]	2
Bioengineering [10]		
Select one of the following: [2,8]		3
ECE 4781	Biomedical Instrumentation [3]	
ECE 4782	Biosystems Analysis [3]	
ECE 4784	Engineering Electrophysiology [3]	
Select two of the following: [2,8]		6
ECE 3084	Signals and Systems	
ECE 4350	Electromagnetic and Microwave Applications	
ECE 4370	Antenna Engineering	
ECE 4435	Operational Amplifier Design	
ECE 4781	Biomedical Instrumentation	
ECE 4782	Biosystems Analysis	
ECE 4784	Engineering Electrophysiology	
Bioengineering Electives		
ECE 3000/4000-level Elective [4]		3
Electric Energy Systems [2,10]		
ECE 3072	Electrical Energy Systems	3

ECE 3300	Electromechanical and Electromagnetic Energy Conversion	3
Select one of the following: [2,8]		3
ECE 4320	Power System Analysis and Control	
ECE 4321	Power System Engineering	
ECE 4325	Electric Power Quality	
ECE 4330	Power Electronics	
ECE 4335	Electric Machinery Analysis	
Electrica Energy Systems Electives		
ECE 3000/4000-level Elective [4]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [7]		3
Free Electives [5,9]		**11**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005.

Courses that are cross-listed with ECE must be taken under the ECE number.

1 Students must complete one Ethics course during their program. For a complete list of Ethics courses, please click here.

2 Minimum grade of C required.

3 Please select any academic course from the Schools of Biological Sciences, Chemistry, Earth and Atmospheric Sciences, or Physics. Research credits may not apply to this requirement.

4 ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

5 The following courses are not allowed: ECE 3710, ECE 3741, HPS 1XXX, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113, and PHYS 2XXX (AP Credit). Maximum of six credit hours of Special Problems or research may be applied toward the degree

6 CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (must be taken for Letter Grade basis)

7 Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

8 No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

9 The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (7)

10 Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Electrical Engineering - Bioengineering and Sensing & Exploration

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS [1]		6

Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 1211	Chemical Principles I	
Science Elective [3]		3
Ethics Requirement [1]		
Probability/Statistics [6, 10]		3
Major Requirements		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 2026	Introduction to Signal Processing [2]	3
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
or ECE 2036	Engineering Software Design	
ECE 2040	Circuit Analysis [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
ECE 3025	Electromagnetics [2]	3
ECE 3040	Microelectronic Circuits [2]	4
ECE 3043	Measurements, Circuits, and Microelectronics Laboratory [2]	2
Bioengineering [10]		
Select one of the following: [2,8]		3
ECE 4781	Biomedical Instrumentation [3]	
ECE 4782	Biosystems Analysis [3]	
ECE 4784	Engineering Electrophysiology [3]	
Select two of the following: [2,8]		6
ECE 3084	Signals and Systems	
ECE 4350	Electromagnetic and Microwave Applications	
ECE 4370	Antenna Engineering	
ECE 4435	Operational Amplifier Design	
ECE 4781	Biomedical Instrumentation	
ECE 4782	Biosystems Analysis	
ECE 4784	Engineering Electrophysiology	
Bioengineering Electives		
ECE 3000/4000-level Elective [4]		3
Sensing & Exploration [2,10]		
ECE 4390	Introduction to Radar and Electromagnetic Sensing [3]	3
Select two of the following: [2,8]		6
ECE 3084	Signals and Systems	
ECE 4260	Random Signals and Applications	
ECE 4350	Electromagnetic and Microwave Applications	
ECE 4360	RF-Microwave Measurement Laboratory	
ECE 4370	Antenna Engineering	
ECE 4580	Computational Computer Vision	
ECE 4781	Biomedical Instrumentation	
Sensing & Exploration Electives		
ECE 3000/4000-level Elective [4]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [7]		3
Free Electives [5,9]		**11**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005.

Courses that are cross-listed with ECE must be taken under the ECE number.

1. Students must complete one Ethics course during their program. For a complete list of Ethics courses, please click here.
2. Minimum grade of C required.
3. Please select any academic course from the Schools of Biological Sciences, Chemistry, Earth and Atmospheric Sciences, or Physics. Research credits may not apply to this requirement.
4. ECE electives are subject to School approval and must satisfy the following constraints:
   1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
   2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.
5. The following courses are not allowed: ECE 3710, ECE 3741, HPS 1XXX, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113, and PHYS 2XXX (AP Credit). Maximum of six credit hours of Special Problems or research may be applied toward the degree
6. CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (must be taken for Letter Grade basis)
7. Senior Design requirements may be satisfied in the following ways:
   1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
   2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

   NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)
8. No single course may be used to satisfy requirements in both selected threads.
   1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
   2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
   3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.
9. The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (7)

[10] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Electrical Engineering - Electric Energy Systems and Sensing & Exploration

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS [1]		6
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Science Elective [3]		3
Ethics Requirement [1]		
Probability/Statistics [6, 10]		3
Major Requirements		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 2026	Introduction to Signal Processing [2]	3
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
or ECE 2036	Engineering Software Design	
ECE 2040	Circuit Analysis [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
ECE 3025	Electromagnetics [2]	3
ECE 3040	Microelectronic Circuits [2]	4
ECE 3043	Measurements, Circuits, and Microelectronics Laboratory [2]	2
Electric Energy Systems [2,10]		
ECE 3072	Electrical Energy Systems	3
ECE 3300	Electromechanical and Electromagnetic Energy Conversion	3
Select one of the following: [2,8]		3
ECE 4320	Power System Analysis and Control	
ECE 4321	Power System Engineering	
ECE 4325	Electric Power Quality	
ECE 4330	Power Electronics	
ECE 4335	Electric Machinery Analysis	
Electric Energy Systems Electives		
ECE 3000/4000-level Elective [4]		3
Sensing & Exploration [10]		
ECE 4390	Introduction to Radar and Electromagnetic Sensing	3
Select two of the following: [2,8]		6
ECE 3084	Signals and Systems	
ECE 4260	Random Signals and Applications	
ECE 4350	Electromagnetic and Microwave Applications	
ECE 4360	RF-Microwave Measurement Laboratory	
ECE 4370	Antenna Engineering	
ECE 4580	Computational Computer Vision	
ECE 4781	Biomedical Instrumentation	
Sensing & Exploration Electives		
ECE 3000/4000-level Elective [4]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [7]		3
Free Electives [5,9]		**11**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005.

Courses that are cross-listed with ECE must be taken under the ECE number.

1. Students must complete one Ethics course during their program. For a complete list of Ethics courses, please click here.
2. Minimum grade of C required.
3. Please select any academic course from the Schools of Biological Sciences, Chemistry, Earth and Atmospheric Sciences, or Physics. Research credits may not apply to this requirement.
4. ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

[5] The following courses are not allowed: ECE 3710, ECE 3741, HPS 1XXX, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113, and PHYS 2XXX (AP Credit). Maximum of six credit hours of Special Problems or research may be applied toward the degree

[6] CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (must be taken for Letter Grade basis)

[7] Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

[8] No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[9] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (7)

[10] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Electrical Engineering - Circuit Technology and Sensing & Exploration

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS [1]		6
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Science Elective [3]		3
Ethics Requirement [1]		
Probability/Statistics [6, 10]		3
Major Requirements		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 2026	Introduction to Signal Processing [2]	3
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
or ECE 2036	Engineering Software Design	
ECE 2040	Circuit Analysis [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
ECE 3025	Electromagnetics [2]	3
ECE 3040	Microelectronic Circuits [2]	4
ECE 3043	Measurements, Circuits, and Microelectronics Laboratory [2]	2
Circuit Technology [2,10]		
ECE 3400	Analog Electronics	3
ECE 4452	IC Fabrication	3
Select one of the following: [2,8]		3

ECE 4043	Senior Analog Electronics Laboratory	
ECE 4415	RF Engineering I	
ECE 4420	Digital Integrated Circuits	
ECE 4430	Analog Integrated Circuits	
ECE 4435	Operational Amplifier Design	
ECE 4502	Optical Fiber Communications	
ECE 4370	Antenna Engineering	
ECE 4391	Electromagnetic Compatibility	
Circuit Technology Electives		
ECE 3000/4000-level Elective [4]		3
Sensing & Exploration [10]		
ECE 4390	Introduction to Radar and Electromagnetic Sensing	3
Select two of the following: [2,8]		6
ECE 3084	Signals and Systems	
ECE 4260	Random Signals and Applications	
ECE 4350	Electromagnetic and Microwave Applications	
ECE 4360	RF-Microwave Measurement Laboratory	
ECE 4370	Antenna Engineering	
ECE 4580	Computational Computer Vision	
ECE 4781	Biomedical Instrumentation	
Sensing & Exploration Electives		
ECE 3000/4000-level Elective [4]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [7]		3
Free Electives [5,9]		**11**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005.

Courses that are cross-listed with ECE must be taken under the ECE number.

1 Students must complete one Ethics course during their program. For a complete list of Ethics courses, please click here.

2 Minimum grade of C required.

3 Please select any academic course from the Schools of Biological Sciences, Chemistry, Earth and Atmospheric Sciences, or Physics. Research credits may not apply to this requirement.

4 ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

5 The following courses are not allowed: ECE 3710, ECE 3741, HPS 1XXX, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113, and PHYS 2XXX (AP Credit). Maximum of six credit hours of Special Problems or research may be applied toward the degree

6 CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (must be taken for Letter Grade basis)

7 Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

8 No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

9 The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (7)

10 Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

Bachelor of Science in Electrical Engineering - Circuit Technology and Telecommunications

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing [2]	3
Core C - Humanities		
Any HUM [1]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus [2]	2
MATH 1554	Linear Algebra [2]	4
Core E - Social Sciences		

Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS [1]		6
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Science Elective [3]		3
Ethics Requirement [1]		
Probability/Statistics [6, 10]		3
Major Requirements		
ECE 1100	ECE Discovery Studio	1
ECE 2020	Digital System Design [2]	3
ECE 2026	Introduction to Signal Processing [2]	3
ECE 2031	Digital Design Laboratory [2]	2
ECE 2035	Programming for Hardware/Software Systems [2]	4
or ECE 2036	Engineering Software Design	
ECE 2040	Circuit Analysis [2]	3
ECE 3005	Professional and Technical Communications for ECE	1
ECE 3025	Electromagnetics [2]	3
ECE 3040	Microelectronic Circuits [2]	4
ECE 3043	Measurements, Circuits, and Microelectronics Laboratory [2]	2
Circuit Technology [2,10]		
ECE 3400	Analog Electronics	3
ECE 4452	IC Fabrication	3
Select one of the following: [2,8]		3
ECE 4043	Senior Analog Electronics Laboratory	
ECE 4415	RF Engineering I	
ECE 4420	Digital Integrated Circuits	
ECE 4430	Analog Integrated Circuits	
ECE 4435	Operational Amplifier Design	
ECE 4502	Optical Fiber Communications	
ECE 4370	Antenna Engineering	
ECE 4391	Electromagnetic Compatibility	
Circuit Technology Electives		
ECE 3000/4000-level Elective [4]		3
Telecommunications [10]		
Select one of the following: [2,8]		3
ECE 3600	Computer Communications	
CS 3251	Computer Networking I	
Select one of the following: [2,8]		3
ECE 4601	Communication Systems	
ECE 4606	Wireless Communications	
Select one of the following: [2,8]		3
ECE 3084	Signals and Systems	
ECE 4350	Electromagnetic and Microwave Applications	
ECE 4370	Antenna Engineering	
ECE 4500	Optical Engineering	
ECE 4601	Communication Systems	
ECE 4605	Topics in Networks	
ECE 4606	Wireless Communications	
ECE 4607	Mobile and Wireless Networks	
Telecommunications Electives		
ECE 3000/4000-level Elective [4]		3
Culminating Senior Design Options (Capstone)		
Culminating Senior Design [7]		3
Free Electives [5,9]		**11**
Total Credit Hours		**129**

Pass-fail only allowed for Humanities Electives, Social Sciences Electives, Free Electives, ECE 1100, and ECE 3005.

Courses that are cross-listed with ECE must be taken under the ECE number.

1 Students must complete one Ethics course during their program. For a complete list of Ethics courses, please click here.

2 Minimum grade of C required.

3 Please select any academic course from the Schools of Biological Sciences, Chemistry, Earth and Atmospheric Sciences, or Physics. Research credits may not apply to this requirement.

4 ECE electives are subject to School approval and must satisfy the following constraints:

1. All ECE courses at the 3000-level or higher, including approved special topics course. Exclusions: Junior Design Fundamentals Course (prerequisite for single-semester capstone) and ECE 3077 (used to satisfy Probability and Statistics requirement).
2. Special problems, undergraduate research, and similar courses may not be included, except for three credit hours for one ECE Undergraduate Research sequence, either ECE 3951+ ECE 3952 or ECE 4951+ ECE 4952. For students completing the Research Option but not an ECE UROP sequence, three credit hours for ECE 4699 may be included.

5 The following courses are not allowed: ECE 3710, ECE 3741, HPS 1XXX, LMC 2661, LMC 2662, LMC 3661, LMC 3662, MATH 1113, and PHYS 2XXX (AP Credit). Maximum of six credit hours of Special Problems or research may be applied toward the degree

6 CEE 3770 or ISYE 3770 or MATH 3670 or ECE 3077 (must be taken for Letter Grade basis)

7 Senior Design requirements may be satisfied in the following ways:

1. ECE two semester 4000 level ECE Culminating Design I + ECE Culminating Design II
2. Approved single-semester capstone (requires completion of the prerequisite ECE Design Fundamentals junior course, which counts as a free elective)

NOTE: Students may be able to use a VIP project in one of the above options to satisfy Senior Design provided they meet the requirements as outlined at the following VIP page. (see https://vip.gatech.edu/how-vip-credits-count)

[8] No single course may be used to satisfy requirements in both selected threads.

1. If a course is **required** in both threads, it must be satisfactorily completed once and the second occurrence shall be replaced by an equivalent number of ECE 3000/4000 elective hours (excluding courses used to satisfy senior design or probability & statistics requirements).
2. If a course is **required** in one thread and **optional** (elective or pick list) in the second thread, it must be completed as required and may not be used to satisfy any element of the second thread.
3. If a course is **optional** (elective or pick list) in both threads, it may be counted once toward either thread, but not toward both.

[9] The total number of available free elective hours will depend on choices made in the thread as well as the choice to fulfill Senior Design requirements according to note (7)

[10] Hours satisfying Probability & Statistics requirement and threads requirements may share with minor requirements.

BACHELOR OF SCIENCE IN ENVIRONMENTAL ENGINEERING

The School of Civil and Environmental Engineering (CEE) offers a BS degree in Environmental Engineering (BS EnvE). The curriculum is designed to provide students with fundamental knowledge of scientific disciplines and engineering principles that are used to address emerging environmental issues such as sustainable air, water, and land resources; human health; and environmental restoration. In the first and second years, students take courses in physics, chemistry, biology, mathematics, English composition, and introductory engineering. The third year incorporates advanced engineering topics, including solid and fluid mechanics, thermodynamics, and laboratories in engineering materials, hydraulic engineering, and environmental monitoring and process engineering. The fourth year is elective based, allowing students to select courses from specific focus areas, including biological processes, sustainability, air pollution, and water resources, in addition to technical and design electives. A senior-level capstone design course serves to integrate principles from a range of disciplines. The curriculum is intended to provide students with the flexibility to develop tailored sequences of electives to meet individual education and career objectives, while ensuring a comprehensive engineering design experience.

Prerequisites and Other Requirements

Students must satisfy all prerequisites for a particular course. In addition to Institute academic requirements for graduation with a BS degree, the following requirements must be satisfied for the BS EnvE:

1. A letter grade of **C** or better must be earned in

Code	Title	Credit Hours
PHYS 2211	Introductory Physics I	4
MATH 1551	Differential Calculus	2
MATH 1552	Integral Calculus	4
MATH 1553	Introduction to Linear Algebra	2
MATH 1554	Linear Algebra	4
MATH 2552	Differential Equations	4
CHEM 1310	Principles of General Chemistry for Engineers	4
COE 2001	Statics	2

2. The total number of quality points earned in CEE courses used to satisfy degree requirements must be at least twice the number of credit hours in those courses. If a course is repeated, the most recent grade will be used in applying this rule. No CEE courses may be repeated for the purpose of satisfying this rule if the original grade was a **C** or higher.

Program Educational Objectives

Graduates will pursue a diverse range of careers that build on their engineering education. During the initial years of their careers, graduates will:

1. be successfully employed in civil- and environmental-related fields, or other career paths, with prominent companies and organizations in industry, government, non-governmental organizations, and entrepreneurial ventures;
2. pursue graduate education and research in civil and environmental engineering, and other fields;
3. be global collaborators, participating in interdisciplinary and culturally diverse teams, and advancing in leadership positions in the profession;
4. continue professional development by obtaining professional licensure or certifications, continuing education credits, or post-graduate study;
5. be active in service to the profession and to the State of Georgia, the nation, and the world.

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [3]	4
Core B - Institutional Options		
CS 1371	Computing for Engineers	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2,3]	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus [3]	2
MATH 1553	Introduction to Linear Algebra [3]	2
or MATH 1554	Linear Algebra	
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
COE 2001	Statics [3]	2
MATH 2551	Multivariable Calculus	4
MATH 2552	Differential Equations [3]	4
CHEM 1310	Principles of General Chemistry for Engineers [3]	4

BIOS 1107 & 1107L	Biological Principles and Biological Principles Laboratory	4
Ethics Requirement (see footnote for courses) [1]		
Major Requirements		
CEE 2040	Dynamics	2
CEE 2300	Environmental Engineering Principles	3
CEE 3000	Civil Engineering Systems	3
CEE 3020	Civil Engineering Materials	3
CEE 3040	Fluid Mechanics	3
CEE 3340	Environmental Engineering Laboratory	3
CEE 3770	Statistics and Applications	3
or ISYE 3770	Statistics and Applications	
CEE 4090	Capstone Design	3
CEE 4200	Hydraulic Engineering	3
COE 3001	Mechanics of Deformable Bodies	3
Additional Requirements		
CHEM 1315	Survey of Organic Chemistry for Engineers	3
EAS 2600	Earth Processes	4
Select one of the following:		3
CHBE 2130	Chemical Engineering Thermodynamics I	
CHEM 3411	Physical Chemistry I	
EAS 3603	Thermodynamics of Earth Systems	
ME 3322	Thermodynamics	
Environmental Engineering Technical Elective		
Select one of the following:		3
CEE 4210	Hydrology	
CEE 3400	Introduction to Geotechnical Engineering	
CEE 4620	Environmental Impact Assessment	
CEE 4795	Groundwater Hydrology	
Design Elective		
Select one of the following:		3
CEE 4310	Water Quality Engineering	
CEE 4340	Environmental Modeling and Health Risk Analysis	
CEE 4330	Air Pollution Engineering	
CEE 4395	Environmental Systems Design Project	
Technical Elective Focus		
Technical Electives [4]		15
Approved Electives		
Approved Electives [5]		6
Total Credit Hours		**129**

No pass-fail allowed, except for CS 1171**.** CEE 4801 **not allowed toward degree.**

Students must earn a 2.0 average in all CEE courses.

Students must earn a minimum of 52 credit hours from the College of Engineering. (40 credit hours of required courses plus a minimum of twelve credit hours from electives.)

1 Students must complete one Ethics course during their program. For a complete list of Ethics courses, please see: Ethics

2 If PHYS 2231 is taken, extra credit hour goes to Free Electives.

3 Minimum grade of C required.

4 Technical Electives Focus may be chosen from the following list: BIOL 2335, BIOL 3380, BMED 3400, BMED 4757, BMED 4758, CEE 3010, CEE 4100, CEE 4210, CEE 4225, CEE 4230, CEE 4300, CEE 4310, CEE 4320, CEE 4330, CEE 4340, CEE 4350, CEE 4405, CEE 4420, CEE 4600, CEE 4620, CEE 4795, CHBE 3200, CHEM 3281, CHEM 3511, CHEM 4740, CP 4210, CP 4510, EAS 4110, EAS 4300, EAS 4410, EAS 4420, EAS 4430, EAS 4480, EAS 4610, EAS 4625, EAS 4740, ECE 3710, ECE 3741, ME 4171, ME 4172 or ME 4782. A maximum of 3 credit hours of CEE 4699 and CEE 4900.

5 Maximum 3 credit hours CEE 2699. MATH 1113, PHYS 2XXX (AP Credit), PHYS 2802, one-credit-hour MUSI courses, GT 1000, and FREE XXXX are not allowed.

Cooperative Plan

Since 1912, Georgia Tech has offered a five-year Undergraduate Cooperative Program to those students who wish to combine career-related experience with classroom studies. The program is the fourth oldest of its kind in the world and the largest optional co-op program in the country.

Students alternate between work assignments and classroom studies until they complete four or five semesters of work. Co-op students with an environmental engineering major complete the same coursework on campus that is completed by regular four-year students. Most co-op students begin the program as freshmen or sophomores and are classified as full time students regardless of whether they are attending classes on campus or are full time at an employer's location.

Students who participate in the program have the opportunity to develop career interests, become more confident in their career choices, and develop human relations skills through their work experience. Graduates of the program receive a bachelor's degree with a Cooperative Plan Designation.

The Undergraduate Professional Internship Program is for environmental engineering students who do not participate in the Cooperative Program, but want some career-related experience before graduation. Students generally work for one semester, usually in the summer, with an option for more work experiences. Students must have completed at least 30 hours of coursework at Georgia Tech before they can participate in the program. For more details, see: http://career.gatech.edu/internships.

In addition, there is a Work Abroad Program (www.workabroad.gatech.edu), which complements a student's formal education with paid international work experience directly related to environmental engineering. Participating students typically are juniors and seniors. The international work assignments are designed to include practical training, cross-cultural exposure and learning, and the acquisition of needed skills. This program satisfies requirements for the International Plan, which is available to environmental engineering students.

For more information about all of the programs in the Center for Career Discovery and Development, visit www.careerdiscovery.gatech.edu.

International Plan

The International Plan is a challenging and coherent academic program for undergraduates that develops global competence within the context of a student's major. It is a degree-long program that integrates international studies and experiences into any participating major at

Georgia Tech. It helps to prepare Georgia Tech graduates professionally and personally for successful lives in the twenty-first century.

The International Plan is not intended to replace current international programs; it supplements them. Existing study abroad opportunities continue to be offered. It is also not intended to be an add-on to the current degree programs. It is intended to be another curriculum path to earn a degree in which international competence is integrated into the program of study. The plan can be completed within the normal timeframe of four years of undergraduate study.

The overarching model for the International Plan has four components:

1. International coursework: Three courses to include one from each of the following categories:
   a. International relations
   b. Global economics
   c. A course about a specific country or region
2. International experience: Two terms abroad (not less than 26 weeks) engaged in any combination of study abroad, research, or internship
3. Second language proficiency: All students in the program are expected to reach at least the proficiency level equivalent to two years of college-level language study. Students who use the language to study, conduct research, or participate in an internship during their international experience are expected to attain a higher level of proficiency. Language proficiency is determined by testing (not course credits).
4. Culminating course: A capstone course in the major designed to tie the international studies and experiences together with the student's major

Completion of the International Plan is recognized by a designation on the student's diploma indicating completion of the degree with global competence.

For additional information about the International Plan visit www.oie.gatech.edu/internationalplan.

Research Option

The Research Option is intended for students who seek a concentrated research experience, culminating in an undergraduate thesis, integrated into their undergraduate studies in environmental engineering. In order to graduate with a BS EnvE – Research Option degree, the students must:

Complete at least nine units of undergraduate research (over at least two, preferably three terms). Research may be for either pay (CEE 2698 or CEE 4698) or credit (CEE 2699 or CEE 4699). Research for credit may be used towards the BS EnvE approved elective requirements. Write an undergraduate thesis/report of research on their findings. This is usually done during the graduating term. The thesis will be published in the Georgia Tech Library.

Take two 1-hour classes: LMC 4701 (typically taken during the first or second semester of research) and LMC 4702 (taken during the thesis-writing semester).

At least six of the nine required credit hours of research should be on the same topic. A research proposal must be approved by a faculty advisor and one other faculty member. This proposal will be completed in LMC 4701 which serves as a prerequisite for LMC 4702. Completion of Research Option is noted on the student's transcript.

Joint BS/MS Degree Program

The joint BS/MS program is designed to attract the best-of-the-best undergraduate students and is especially intended for students who demonstrate an interest in, and ability for, additional education beyond the bachelor's degree.

Students will be eligible to apply for the program after completion of 30 semester credit hours at Georgia Tech and appropriate progress in their degree program. As a practical matter, students should apply for the program at least three semesters prior to graduation in order to take graduate-level courses prior to receiving their BS degree. Students must have a Georgia Tech GPA of 3.5 or higher for admission into the BS/MS Program in Environmental Engineering.

This program is available only to those completing a Bachelor's degree with majors of Civil Engineering or Environmental Engineering.

The key components of this program are intense interaction among students and faculty, including mentoring and undergraduate research, and careful advising and course planning to enable students to begin challenging coursework in their fourth year of study.

Students in the joint BS/MS program remain undergraduates until they meet the requirements for the bachelor's degree, at which point they will receive the BSEnvE degree. Their status will then be changed to graduate status. Graduate school application fees and the GRE requirements are waived.

Once admitted, a GPA of at least 3.0 must be maintained to remain in the program. Additionally, students in the BS/MS program are eligible to use the Graduate Course Option even if their cumulative grade-point average is below 3.5 at the time they complete their bachelor's degree.

BACHELOR OF SCIENCE IN ENVIRONMENTAL SCIENCE

The Bachelor of Science in Environmental Science encompasses the study of natural environmental systems and the interaction of humans with these systems. It includes a strong foundation in the basic sciences, requiring core content in mathematics, physics, chemistry, biology, Earth sciences, and environmental policy. Upper-level coursework builds lab, field, communication, and computational skills. Students will be encouraged to create a focused pathway of electives that matches their interests and career goals. This degree program will prepare students for careers in environmental consulting, conservation, environmental sustainability, and environmental education. #It will also provide a strong base for students interested in pursuing graduate programs and careers in environmental policy, environmental law, medicine, and other master's and Ph.D. programs in environmentally related disciplines.

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
or CS 1371	Computing for Engineers	
Core C - Humanities [1]		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I	4
CHEM 1211K	Chemical Principles I	4
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
Core E - Social Sciences [1]		
Select one of the following:		3
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
Any SS		9
Core F - Courses Related to Major		
CHEM 1212K	Chemical Principles II	4
or CHEM 13	Survey of Organic Chemistry for Engineers	
EAS 1600	Introduction to Environmental Science	4
EAS 2600	Earth Processes	4
Must complete one:		4
BIOS 1207 & 1207L	Biological Principles for Majors and Biological Principles Project Laboratory	
BIOS 1107 & 1107L	Biological Principles and Biological Principles Laboratory	
Must complete one:		4
BIOS 2300 & BIOS 2301	Ecology and Ecology Laboratory	
BIOS 2310 & BIOS 231	Problems in Ecology and Problems in Ecology Laboratory	
Major Requirements		
EAS 4480	Environmental Data Analysis	3
PUBP 4530	Introduction to Geographic Information Systems	3
or CP 4510	Fundamentals of Geographic Information Systems	
or EAS 4380	Land Remote Sensing	
PUBP 3315	Environmental Policy and Politics	3
EAS 4410	Climate and Global Change	3
EAS 4420	Environmental Field Methods	4
Must complete one:		4
BIOS 3380 & BIOS 338	Microbiology and Microbiology Lab	
EAS 4220 & EAS 4221	Environmental Geochemistry and Environmental Geochemistry Lab	
Environmental Science Electives		**9**
BIOS 3100	Ecology & Evolution: An Australian Perspective	
BIOS 3380	Microbiology	
BIOS 3600	Evolutionary Biology	
BIOS 4221	Biological Oceanography	
BIOS 4340	Medical Microbiology	
BIOS 4401	Experimental Design and Statistical Methods in Biological Sciences	
BIOS 4417	Marine Ecology	
BIOS 4418	Microbial Physiology	
BIOS 4428	Population Dynamics	
BIOS 4515	Community Ecology	
BIOS 4607	Molecular Biology of Microbes: Disease, Nature, and Biotechnology	
BIOS 4620	Aquatic Chemical Ecology	
BIOS 4651	Bioethics	
BIOS 4690	Independent Research Project	
BIOS 4699	Undergraduate Research	
BIOS 4803	Special Topics (Conservation Biology)	
BIOS 4803	Special Topics (Biology of Terrestrial Vertebrates)	
BIOS 4803	Special Topics (Ornithology)	
BIOS 4813	Special Topics (Biodiversity on a Changing Planet)	
CEE 4300	Environmental Engineering Systems	
CEE 4330	Air Pollution Engineering	
CEE 4350	Environmental Technology in the Developing World	
CEE 4360	Energy and Resource Recovery	
CHEM 3700	The Science of Alternative Energy	
CHEM 4740	Atmospheric Chemistry	
CP 4052	Sustainable Cities Studio	
CP 4105	Land Conservation	

	CP 4190	Introduction to Climate Change Planning
	CP 4210	Environmental Planning and Impact Assessment
	EAS 3110	Energy, Environment, and Society
	EAS 3603	Thermodynamics of Earth Systems
	EAS 3803	Special Topics (Geologic History)
	EAS 4205	Geomorphology
	EAS 4220	Environmental Geochemistry
	EAS 4221	Environmental Geochemistry Lab
	EAS 4224	Mineral Surface Geochemistry
	EAS 4300	Introduction to Physical and Chemical Oceanography
	EAS 4305	Physical and Chemical Oceanography
	EAS 4350	Paleoclimatology and Paleoceanography
	EAS 4375	Earth and Planetary Materials
	EAS 4380	Land Remote Sensing
	EAS 4430	Remote Sensing and Data Analysis
	EAS 4515	Fluids in the Earth's Crust I
	EAS 4525	Weather Risk and Catastrophe Modeling
	EAS 4602	Biogeochemical Cycles
	EAS 4699	Undergraduate Research
	EAS 4740	Atmospheric Chemistry Laboratory
	EAS 4795	Groundwater Hydrology
	EAS 4803	Special Topics (Glacier and Ice Sheet Dynamics)
	EAS 4803	Special Topics (Basics of Geoengineering)
	EAS 4803	Special Topics (Sea-level Rise and Coastal Engineering)
	EAS 4813	Special Topics (Extreme Atlanta: Climate Change in Urban Spaces)
	ECON 3300	Economics of International Energy Markets
	ECON 4440	Economics of Natural Resources and the Environment
	HTS 3005	American Environmental History
	HTS 3081	Technology and the Environment
	INTA 3040	Energy, Environment, and Policy
	INTA 4040	Environmental Politics
	PHIL 4176	Environmental Ethics
	PUBP 3320	Climate Policy
	PUBP 3350	Energy Policy
	PUBP 3600	Sustainability, Technology, and Policy
	PUBP 4440	Science, Technology, and Regulation
	PUBP 4530	Introduction to Geographic Information Systems
	PUBP 4620	Environmental Law
Upper Division Electives [2]		**7**
Free Electives		**21**
Total Credit Hours		**122**

Students must complete a minimum of 39-hours of 3000/4000-level coursework.

[1] Pass/Fail allowed only for Humanities, Social Sciences, and Free electives

[2] 3000/4000-level courses in any field chosen by the student

BACHELOR OF SCIENCE IN GLOBAL ECONOMICS AND MODERN LANGUAGES

In partnership with the School of Modern Languages, the School of Economics offers a Bachelor of Science in Global Economics and Modern Languages with language concentrations in Chinese, French, German, Japanese, Korean, Russian, or Spanish. Global Economics and Modern Language graduates are especially attractive to employers with long-term interests outside the United States who demand employees prepared to successfully navigate the challenges and opportunities presented by global, economically interdependent, multilingual, and multicultural environments. Through a variety of coursework and the opportunity to spend a semester abroad, students have in-depth knowledge not only of their own cultures but also have the capacity to function effectively in a second culture. Coursework focuses on rigorous training in economics combined with extensive foreign language study. Students are expected to develop advanced communication skills and professional competency in the language of choice through courses and extracurricular opportunities that focus on current issues, classic literature, business applications, and cross-cultural perspectives.

- Bachelor of Science in Global Economics and Modern Languages - Chinese
- Bachelor of Science in Global Economics and Modern Languages - French
- Bachelor of Science in Global Economics and Modern Languages - German
- Bachelor of Science in Global Economics and Modern Languages - Japanese
- Bachelor of Science in Global Economics and Modern Languages - Korean
- Bachelor of Science in Global Economics and Modern Languages - Russian
- Bachelor of Science in Global Economics and Modern Languages - Spanish

International Plan

The degree requirements for the Global Economics and Modern Languages (Chinese, French, German, Japanese, Korean, Russian and Spanish)-International Plan are basically the same as for the GEML degree, except that students are required to spend two terms abroad and then achieve Intermediate High (for Chinese, Japanese or Russian: Intermediate Low) on the standardized ACTFL testing scale during an oral interview. The costs of the test will be paid for by the School of Modern Languages for each student. The terms abroad may typically consist of one semester of study plus a significant amount of time spent with a research or work project abroad. Students may also opt for a second semester. GEML-IP majors are also strongly encouraged to enroll in the LBAT intensive summer programs offered by the School of Modern Languages.

In addition to gaining advanced global competence, the International Plan designation will set you apart from other applicants with recruiters from top companies and governmental agencies.

Other Required Courses include the following, and these can easily be obtained within the regular required curriculum offerings of ECON and Modern Languages. These requirements can also be met with courses taken abroad, upon consultation with ECON degree advisors.

1. At least one course focused on international relations historically and theoretically, including topics such as
   a. the role of state sovereignty and nationalism and non-state actors in the international system;
   b. international conflict, peace, security, intervention, and nation-building;
   c. international organizations, law, and ethics;
   d. transnational problems of the environment, terrorism, health, and migration;
   e. among other issues (see INTA courses).
2. At least one course that provides a historical and theoretical understanding of the global economy, including topics such as
   a. international trade, finance, investment, and production;
   b. regional economic integration (such as the EU);
   c. economic development and modernization; and
   d. questions of natural resource sustainability.
3. At least one course that provides familiarity with an area of the world or a country that allows them to make systematic comparisons with their own society and culture. This course could come from various disciplinary perspectives, including history, public policy, philosophy, international affairs, literature, economics, management, architecture, among others. Upper division Modern Language course will count here.
4. A culminating course, occurring either at the end of or after the international experience that integrates knowledge of the discipline and the international experience in a global context.

Bachelor of Science in Global Economics and Modern Languages - Chinese

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1315	Introduction to Media Computation	3
or CS 1301	Introduction to Computing	
Core C - Humanities		
Modern Languages [2,3]		6

Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
ECON 2105	Principles of Macroeconomics [3]	3
ECON 2106	Principles of Microeconomics [3]	3
Statistics Elective [3,5]		3
Engineering/Science/Math Elective [1]		3
Modern Languages [2,3]		6
Major Requirements		
ECON 3110	Advanced Microeconomic Analysis [3]	3
ECON 3120	Advanced Macroeconomic Analysis [3]	3
ECON 3161	Econometric Analysis [3]	3
ECON Electives		
ECON Electives [3,6]		15
Non-Major Cluster		
Cluster Electives [3,4]		12
Modern Languages		
CHIN 4500	Advanced Intercultural Seminar [3]	3
Modern Languages [2,3,8]		9
Free Electives		
Free Electives [7]		11
Total Credit Hours		**122**

1. Any 1000- or 2000-level course with the following prefixes: AE, APPH, BIOL, BMED, CEE, CHBE, CHEM, EAS, ECE, ISYE, MATH, ME, MSE, NRE, PHYS.
2. Students must complete 21 credit hours of Chinese electives at 2002 (or its equivalent), 3000-level and above. Six credit hours are counted in Humanities, six in Core Area F, and 9 in Modern Languages Requirements. Students can only count one CHIN 34XX course toward 3 of the 21 credits of Chinese electives as 34XX courses reflect culture courses taught in English.
3. Minimum grade of C required.
4. Non-Major Cluster Electives must be advisor approved.
5. One course from ECON 2250, MATH 3215, ISYE 3770 or (MGT 2250 - minimum B)
6. Nine credit hours of Econ Electives must be chosen from one of the following list of Development Economics or International Economics courses: ECON 4311, ECON 4351, ECON 4352, ECON 4355, ECON 4357, ECON 4411, ECON 4415, ECON 4421
7. CHIN courses below 2002 may count toward the free elective courses.
8. Students are strongly encouraged to study, intern, or work abroad in the language of study or to seek out internship or research opportunities with international organizations.

Bachelor of Science in Global Economics and Modern Languages - French

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1315	Introduction to Media Computation	3
or CS 1301	Introduction to Computing	
Core C - Humanities		
Modern Languages [2,3]		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
ECON 2105	Principles of Macroeconomics [3]	3
ECON 2106	Principles of Microeconomics [3]	3
Statistics Elective [3,5]		3
Engineering/Science/Math Elective [1]		3
Modern Languages [2,3]		6
Major Requirements		
ECON 3110	Advanced Microeconomic Analysis [3]	3
ECON 3120	Advanced Macroeconomic Analysis [3]	3
ECON 3161	Econometric Analysis [3]	3
ECON Electives		
ECON Electives [3,6]		15
Non-Major Cluster		

Cluster Electives [3,4]		12
Modern Languages		
FREN 4500	Advanced Intercultural Seminar [3]	3
Modern Languages [2,3,8]		9
Free Electives		
Free Electives [7]		11
Total Credit Hours		**122**

1. Any 1000- or 2000-level course with the following prefixes: AE, APPH, BIOL, BMED, CEE, CHBE, CHEM, EAS, ECE, ISYE, MATH, ME, MSE, NRE, PHYS.
2. Students must complete 21 credit hours of French electives at 2002 (or its equivalent), 3000-level and above. Six credit hours are counted in Humanities, six in Core Area F, and 9 in Modern Languages Requirements. Students can only count one FREN 34XX course toward 3 of the 21 credits of French electives as 34XX courses reflect culture courses taught in English
3. Minimum grade of C required.
4. Non-Major Cluster Electives must be advisor approved.
5. One course from ECON 2250, MATH 3215, ISYE 3770 or (MGT 2250 - minimum B)
6. Nine credit hours of Econ Electives must be chosen from the following list of Development Economics or International Economics courses: ECON 4311, ECON 4351, ECON 4352, ECON 4355, ECON 4357, ECON 4411, ECON 4415, ECON 4421
7. FREN courses below 2002 may count toward the free elective courses.
8. Students are strongly encouraged to study, intern, or work abroad in the language of study or to seek out internship or research opportunities with international organizations

Bachelor of Science in Global Economics and Modern Languages - German

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1315	Introduction to Media Computation	3
or CS 1301	Introduction to Computing	
Core C - Humanities		
Modern Languages [2,3]		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics	4
or MATH 15	Differential Calculus & MATH 15 and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
ECON 2105	Principles of Macroeconomics [3]	3
ECON 2106	Principles of Microeconomics [3]	3
Statistics Elective [3,5]		3
Engineering/Science/Math Elective [1]		3
Modern Languages [2,3]		6
Major Requirements		
ECON 3110	Advanced Microeconomic Analysis [3]	3
ECON 3120	Advanced Macroeconomic Analysis [3]	3
ECON 3161	Econometric Analysis [3]	3
ECON Electives		
ECON Electives [3,6]		15
Non-Major Cluster		
Cluster Electives [3,4]		12
Modern Languages		
GRMN 4500	Advanced Intercultural Seminar [3]	3
Modern Languages [2,3,8]		9
Free Electives		
Free Electives [7]		11
Total Credit Hours		**122**

1. Any 1000- or 2000-level course with the following prefixes: AE, APPH, BIOL, BMED, CEE, CHBE, CHEM, EAS, ECE, ISYE, MATH, ME, MSE, NRE, PHYS.
2. Students must complete 21 credit hours of German electives at 2002 (or its equivalent), 3000-level and above. Six credit hours are counted in Humanities, six in Core Area F, and 9 in Modern Languages Requirements. Students can only count one GRMN 34XX course toward 3 of the 21 credits of German electives as 34XX courses reflect culture courses taught in English
3. Minimum grade of C required.
4. Non-Major Cluster Electives must be advisor approved.
5. One course from ECON 2250, MATH 3215, ISYE 3770 or (MGT 2250 - minimum B)
6. Nine credit hours of Econ Electives must be chosen from the following list of Development Economics or International Economics courses: ECON 4311, ECON 4351, ECON 4352, ECON 4355, ECON 4357, ECON 4411, ECON 4415, ECON 4421
7. GRMN courses below 2002 may count toward the free elective courses.
8. Students are strongly encouraged to study, intern, or work abroad in the language of study or to seek out internship or research opportunities with international organizations

Bachelor of Science in Global Economics and Modern Languages - Japanese

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1315	Introduction to Media Computation	3
or CS 1301	Introduction to Computing	
Core C - Humanities		
Modern Languages [2,3]		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
ECON 2105	Principles of Macroeconomics [3]	3
ECON 2106	Principles of Microeconomics [3]	3
Statistics Elective [3,5]		3
Engineering/Science/Math Elective [1]		3
Modern Languages [2,3]		6
Major Requirements		
ECON 3110	Advanced Microeconomic Analysis [3]	3
ECON 3120	Advanced Macroeconomic Analysis [3]	3
ECON 3161	Econometric Analysis [3]	3
ECON Electives		
ECON Electives [3,6]		15
Non-Major Cluster		
Cluster Electives [3,4]		12
Modern Languages		
JAPN 4500	Advanced Intercultural Seminar [3]	3
Modern Languages [2,3,8]		9
Free Electives		
Free Electives [7]		11
Total Credit Hours		**122**

1. Any 1000- or 2000-level course with the following prefixes: AE, APPH, BIOL, BMED, CEE, CHBE, CHEM, EAS, ECE, ISYE, MATH, ME, MSE, NRE, PHYS.
2. Students must complete 21 credit hours of Japanese electives at 2002 (or its equivalent), 3000-level and above. Six credit hours are counted in Humanities, six in Core Area F, and 9 in Modern Languages Requirements. Students can only count one JAPN 34XX course toward 3 of the 21 credits of Japanese electives as 34XX courses reflect culture courses taught in English.
3. Minimum grade of C required.
4. Non-Major Cluster Electives must be advisor approved.
5. One course from ECON 2250, MATH 3215, ISYE 3770 or (MGT 2250 - minimum B)
6. Nine credit hours of Econ Electives must be chosen from the following list of Development Economics or International Economics courses: ECON 4311, ECON 4351, ECON 4352, ECON 4355, ECON 4357, ECON 4411, ECON 4415, ECON 4421
7. JAPN courses below 2002 may count toward the free elective courses.
8. Students are strongly encouraged to study, intern, or work abroad in the language of study or to seek out internship or research opportunities with international organizations

Bachelor of Science in Global Economics and Modern Languages - Korean

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1315	Introduction to Media Computation	3
or CS 1301	Introduction to Computing	
Core C - Humanities		
Modern Languages [2,3]		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	

HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
ECON 2105	Principles of Macroeconomics [3]	3
ECON 2106	Principles of Microeconomics [3]	3
Statistics Elective [3,5]		3
Engineering/Science/Math Elective [1]		3
Modern Languages [2,3]		6
Major Requirements		
ECON 3110	Advanced Microeconomic Analysis [3]	3
ECON 3120	Advanced Macroeconomic Analysis [3]	3
ECON 3161	Econometric Analysis [3]	3
ECON Electives		
ECON Electives [3,6]		15
Non-Major Cluster		
Cluster Electives [3,4]		12
Modern Languages		
KOR 4500	Intercultural Seminar	3
Modern Languages [2,3,8]		9
Free Electives		
Free Electives [7]		11
Total Credit Hours		**122**

1. Any 1000- or 2000-level course with the following prefixes: AE, APPH, BIOL, BMED, CEE, CHBE, CHEM, EAS, ECE, ISYE, MATH, ME, MSE, NRE, PHYS.
2. Students must complete 21 credit hours of Korean electives at 2002 (or its equivalent), 3000-level and above. Six credit hours are counted in Humanities, six in Core Area F, and 9 in Modern Languages Requirements. Students can only count one KOR 34XX course toward 3 of the 21 credits of Korean electives as 34XX courses reflect culture courses taught in English
3. Minimum grade of C required.
4. Non-Major Cluster Electives must be advisor approved.
5. One course from ECON 2250, MATH 3215, ISYE 3770 or (MGT 2250 - minimum B)
6. Nine credit hours of Econ Electives must be chosen from the following list of Development Economics or International Economics courses: ECON 4311, ECON 4351,ECON 4352, ECON 4355, ECON 4357, ECON 4411, ECON 4415, ECON 4421
7. KOR courses below 2002 may count toward the free elective courses.
8. Students are strongly encouraged to study, intern, or work abroad in the language of study or to seek out internship or research opportunities with international organizations

Bachelor of Science in Global Economics and Modern Languages - Russian

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1315	Introduction to Media Computation	3
or CS 1301	Introduction to Computing	
Core C - Humanities		
Modern Languages [2,3]		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
ECON 2105	Principles of Macroeconomics [3]	3
ECON 2106	Principles of Microeconomics [3]	3
Statistics Elective [3,5]		3
Engineering/Science/Math Elective [1]		3
Modern Languages [2,3]		6
Major Requirements		
ECON 3110	Advanced Microeconomic Analysis [3]	3
ECON 3120	Advanced Macroeconomic Analysis [3]	3
ECON 3161	Econometric Analysis [3]	3
ECON Electives		
ECON Electives [3,6]		15
Non-Major Cluster		
Cluster Electives [3,4]		12
Modern Languages		
RUSS 4500	Russian Intercultural Capstone Seminar [3]	3
Modern Languages [2,3,8]		9

Free Electives		
Free Electives [7]		11
Total Credit Hours		**122**

1. Any 1000- or 2000-level course with the following prefixes: AE, APPH, BIOL, BMED, CEE, CHBE,CHEM, EAS, ECE, ISYE, MATH, ME, MSE, NRE, PHYS.
2. Students must complete 21 credit hours of Russian electives at 2002 (or its equivalent), 3000-level and above. Six credit hours are counted in Humanities, six in Core Area F, and 9 in Modern Languages Requirements. Students can only count one RUSS 34XX course toward 3 of the 21 credits of Russian electives as 34XX courses reflect culture courses taught in English
3. Minimum grade of C required.
4. Non-Major Cluster Electives must be advisor approved.
5. One course from ECON 2250, MATH 3215, ISYE 3770 or (MGT 2250 - minimum B)
6. Nine credit hours of Econ Electives must be chosen from the following list of Development Economics or International Economics courses: ECON 4311, ECON 4351, ECON 4352, ECON 4355, ECON 4357, ECON 4411, ECON 4415, ECON 4421
7. RUSS courses below 2002 may count toward the free elective courses.
8. Students are strongly encouraged to study, intern, or work abroad in the language of study or to seek out internship or research opportunities with international organizations

Bachelor of Science in Global Economics and Modern Languages - Spanish

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
Core B - Institutional Options		
MATH 1712	Survey of Calculus	4
or MATH 152	Integral Calculus	
CS 1315	Introduction to Media Computation	3
or CS 1301	Introduction to Computing	
Core C - Humanities		
Modern Languages [2,3]		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
ECON 2105	Principles of Macroeconomics [3]	3
ECON 2106	Principles of Microeconomics [3]	3
Statistics Elective [3,5]		3
Engineering/Science/Math Elective [1]		3
Modern Languages [2,3]		6
Major Requirements		
ECON 3110	Advanced Microeconomic Analysis [3]	3
ECON 3120	Advanced Macroeconomic Analysis [3]	3
ECON 3161	Econometric Analysis [3]	3
ECON Electives		
ECON Electives [3,6]		15
Non-Major Cluster		
Cluster Electives [3,4]		12
Modern Languages		
SPAN 4500	Advanced Intercultural Seminar [3]	3
Modern Languages [2,3,8]		9
Free Electives		
Free Electives [7]		11
Total Credit Hours		**122**

1. Any 1000- or 2000-level course with the following prefixes: AE, APPH, BIOL, BMED, CEE, CHBE, CHEM, EAS, ECE, ISYE, MATH, ME, MSE, NRE, PHYS.
2. Students must complete 21 credit hours of Spanish electives at 2002 (or its equivalent), 3000-level and above. Six credit hours are counted in Humanities, six in Core Area F, and 9 in Modern Languages Requirements. Students can only count one SPAN 34XX course toward 3 of the 21 credits of Spanish electives as 34XX courses reflect culture courses taught in English
3. Minimum grade of C required.
4. Non-Major Cluster Electives must be advisor approved.
5. One course from ECON 2250, MATH 3215, ISYE 3770 or (MGT 2250 - minimum B)
6. Nine credit hours of Econ Electives must be chosen from the following list of Development Economics or International Economics courses: ECON 4311, ECON 4351, ECON 4352, ECON 4355, ECON 4357, ECON 4411, ECON 4415, ECON 4421
7. SPAN courses below 2002 may count toward the free elective courses.
8. Students are strongly encouraged to study, intern, or work abroad in the language of study or to seek out internship or research opportunities with international organizations

BACHELOR OF SCIENCE IN HISTORY, TECHNOLOGY, AND SOCIETY

The bachelor's degree in History, Technology, and Society (BS-HTS) is comparable to traditional degrees in history and sociology, but has several attributes that make it unique and give our students an edge over other liberal arts majors. A degree in HTS requires broad-based training in humanities, mathematics, computing, science, and social sciences, giving our majors a truly rigorous and broad education. The program's focus on global issues related to the origin and impact of technology and science is also distinctive, providing students with the critical tools needed to understand the development of the modern world. Students earning a degree in HTS may participate in both the International Plan and the Research Option, which enhance the undergraduate experience. Finally, the HTS curriculum allows one of the largest numbers of free electives of any major at Georgia Tech, giving our students a chance to pursue minor degrees, certificates, and other interests that prepare them for the broadest possible range of careers, from government and politics to law and medicine to journalism and business.

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
Core C - Humanities		
Modern Language [8]		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics [6]	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
HTS Electives [2]		9
Core F - Courses Related to Major		
Select one of the following: [3]		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
HTS Elective [3]		3
Select two of the following: [3]		6
HTS 1031	Europe Since the Renaissance	
HTS 2036	Revolutionary Europe: 1789-1914	
HTS 2037	Twentieth Century Europe: 1914 to Present	
HTS 2040	History of Islamic Societies	
HTS 2041	History of the Modern Middle East	
HTS 2061	Traditional Asia and Its Legacy	
HTS 2062	Asia in the Modern World	
HTS 3028	Ancient Greece: Gods, Heroes, and RuinS	
HTS 3029	Ancient Rome: From Greatness to Ruins	
HTS 3030	Medieval Europe: 350 to 1400	
HTS 3031	European Labor History	
HTS 3032	Modern European Intellectual History	
HTS 3033	Medieval England	
HTS 3035	Britain from 1815-1914	
HTS 3036	Britain Since 1914	
HTS 3038	The French Revolution	
HTS 3039	Modern France	
HTS 3041	Modern Spain	
HTS 3043	Modern Germany	
HTS 3045	Nazi Germany and the Holocaust	
HTS 3046	Science, Polilitics, and Culture in Nazi Germany	
HTS 3048	Modern Russian History and Society	
HTS 3051	Women and the Politics of Gender in the Middle East	
HTS 3055	Globalization in the Modern Era	
HTS 3061	Modern China	
HTS 3062	Modern Japan	
HTS 3063	Outposts of Empire: Comparative History of British	
HTS 3064	Sociology of Development	
HTS 3065	History of Global Societies	
HTS 3069	Modern Cuba	
HTS 2101	Historical and Social Research [3]	3
HIST 2111	The United States to 1877 [1,3]	3
or HIST 211	The United States since 1877	
SOC 1101	Introduction to Sociology [3]	3
Major Requirements		
Select two of the following: [3]		6
HTS 1081	Engineering in History	
HTS 2080	Introduction to the History of Disease and Medicine	
HTS 2081	The Scientific Revolution	
HTS 2082	Technology and Science in the Industrial Age	
HTS 2084	Technology and Society	
HTS 2100	Sci, Tech & Modern World	
HTS 3001	American Economic History	

HTS 3007	Sociology of Work, Industry, and Occupations	
HTS 3020	Gender and Technology	
HTS 3021	Women in Science and Engineering	
HTS 3046	Science, Polilitics, and Culture in Nazi Germany	
HTS 3080	History of Rocketry	
HTS 3081	Technology and the Environment	
HTS 3082	Sociology of Science	
HTS 3083	Technology and the Shaping of American Society	
HTS 3084	Culture and Technology	
HTS 3085	Law, Technology, and Politics	
HTS 3086	Sociology of Medicine and Health	
HTS 3087	History of Medicine	
HTS 3088	Race, Medicine & Science	
HTS 3089	Sceince, Technology and Sports	
Select 8 credit hours of the following: [3]		8
HTS 4001	Seminar in United States History	
HTS 4011	Seminar in Sociology	
HTS 4031	Seminar in European History	
HTS 4061	Seminar in Asian History	
HTS 4081	Seminar in History of Technology	
HTS 4086	Seminar in Health, Medicine, and Society	
HTS 4091	Seminar in Global Issues	
HTS Elective		3
HTS Specialization Electives		**9**
Select three classes from one of the following specialization groups:		
U.S. Society		
HTS 2001	Early American History	
HTS 2002	The American Revolution and Constitution	
HTS 2006	History of the Old South to 1865	
HTS 2007	History of the New South since 1865	
HTS 2011	The Gilded Age and the Progressive Era	
HTS 2013	Modern America: World War II and After	
HTS 2015	History of Sports in America	
HTS 2052	North American Borderlands	
HTS 2085	Reel History I: US History through Hollywood Films	
HTS 3001	American Economic History	
HTS 3002	History of American Business	
HTS 3005	American Environmental History	
HTS 3006	United States Labor History	
HTS 3009	The American Civil War	
HTS 3011	The City in American History	
HTS 3012	Urban Sociology	
HTS 3015	History of the Vietnam War	
HTS 3016	Women and Gender in the United States	
HTS 3018	New Religions and Cults in America	
HTS 3019	The Family, Sexuality, and Social Change in America	
HTS 3022	Gender and Sports	
HTS 3023	Slaves without Masters: Free People of Color before 1865	
HTS 3024	African American History to 1865	
HTS 3025	African American History since 1865	
HTS 3026	Sociology of Race and Ethnicity	
HTS 3027	The Civil Rights Movement	
HTS 3068	Social Movements	
HTS 3070	Culture and Society	
HTS 3073	Sociology of Sports	
HTS 3083	Technology and the Shaping of American Society	
HTS 3100	Introduction to Museum Studies	
Global Studies		
HTS 1031	Europe Since the Renaissance	
HTS 2036	Revolutionary Europe: 1789-1914	
HTS 2037	Twentieth Century Europe: 1914 to Present	
HTS 2040	History of Islamic Societies	
HTS 2041	History of the Modern Middle East	
HTS 2051	Colonial Latin America and the World	
HTS 2061	Traditional Asia and Its Legacy	
HTS 2062	Asia in the Modern World	
HTS 2100	Sci, Tech & Modern World	
HTS 3030	Medieval Europe: 350 to 1400	
HTS 3031	European Labor History	
HTS 3032	Modern European Intellectual History	
HTS 3033	Medieval England	
HTS 3035	Britain from 1815-1914	
HTS 3036	Britain Since 1914	
HTS 3038	The French Revolution	
HTS 3039	Modern France	
HTS 3041	Modern Spain	
HTS 3043	Modern Germany	
HTS 3045	Nazi Germany and the Holocaust	
HTS 3046	Science, Polilitics, and Culture in Nazi Germany	
HTS 3048	Modern Russian History and Society	
HTS 3051	Women and the Politics of Gender in the Middle East	
HTS 3055	Globalization in the Modern Era	
HTS 3061	Modern China	
HTS 3062	Modern Japan	
HTS 3063	Outposts of Empire: Comparative History of British	
HTS 3064	Sociology of Development	
HTS 3065	History of Global Societies	
HTS 3067	Revolutionary Movements in the Modern World	
HTS 3069	Modern Cuba	
Politics, Economics, and Innovation		
HTS 1081	Engineering in History	
HTS 2016	Social Issues and Public Policy	
HTS 2100	Sci, Tech & Modern World	
HTS 3001	American Economic History	
HTS 3002	History of American Business	
HTS 3003	Sociology of Economic Institutions	
HTS 3006	United States Labor History	
HTS 3007	Sociology of Work, Industry, and Occupations	

HTS 3031	European Labor History
HTS 3064	Sociology of Development
HTS 3066	Sociology of Politics and Society
HTS 3068	Social Movements
HTS 3080	History of Rocketry
HTS 3083	Technology and the Shaping of American Society
HTS 3084	Culture and Technology
HTS 3085	Law, Technology, and Politics
Science, Technology, and Medicine	
HTS 1081	Engineering in History
HTS 2080	Introduction to the History of Disease and Medicine
HTS 2081	The Scientific Revolution
HTS 2082	Technology and Science in the Industrial Age
HTS 2084	Technology and Society
HTS 2100	Sci, Tech & Modern World
HTS 3020	Gender and Technology
HTS 3021	Women in Science and Engineering
HTS 3046	Science, Polilitics, and Culture in Nazi Germany
HTS 3080	History of Rocketry
HTS 3081	Technology and the Environment
HTS 3082	Sociology of Science
HTS 3083	Technology and the Shaping of American Society
HTS 3084	Culture and Technology
HTS 3085	Law, Technology, and Politics
HTS 3086	Sociology of Medicine and Health
HTS 3087	History of Medicine
HTS 3088	Race, Medicine & Science
HTS 3089	Sceince, Technology and Sports
Communities, Environment, and Sustainability	
HTS 3005	American Environmental History
HTS 3011	The City in American History
HTS 3012	Urban Sociology
HTS 3026	Sociology of Race and Ethnicity
HTS 3064	Sociology of Development
HTS 3071	Sociology of Crime
HTS 3072	Sociology of Education
HTS 3081	Technology and the Environment
Power, Inequality, and Social Justice	
HTS 2016	Social Issues and Public Policy
HTS 3006	United States Labor History
HTS 3008	Class, Power, and Social Inequality
HTS 3011	The City in American History
HTS 3012	Urban Sociology
HTS 3016	Women and Gender in the United States
HTS 3017	Sociology of Gender
HTS 3020	Gender and Technology
HTS 3021	Women in Science and Engineering
HTS 3022	Gender and Sports
HTS 3023	Slaves without Masters: Free People of Color before 1865
HTS 3024	African American History to 1865
HTS 3025	African American History since 1865
HTS 3026	Sociology of Race and Ethnicity
HTS 3027	The Civil Rights Movement
HTS 3031	European Labor History
HTS 3051	Women and the Politics of Gender in the Middle East
HTS 3067	Revolutionary Movements in the Modern World
HTS 3068	Social Movements
HTS 3071	Sociology of Crime
HTS 3072	Sociology of Education
Culture and Society	
HTS 2015	History of Sports in America
HTS 2085	Reel History I: US History through Hollywood Films
HTS 3022	Gender and Sports
HTS 3046	Science, Polilitics, and Culture in Nazi Germany
HTS 3070	Culture and Society
HTS 3073	Sociology of Sports
HTS 3084	Culture and Technology
HTS 3100	Introduction to Museum Studies
Custom Specialization [6]	
Non-Major Cluster	
Non-Major Cluster [4,5]	12
Free Electives	
Free Electives [5]	18
Total Credit Hours	**122**

Pass/fail: Students can do pass/fail for HTS electives, non-major cluster, and free electives. However, students who complete at least 91 credit hours at Georgia Tech are limited to 6 pass/fail credit hours in HTS electives and students who complete less than 90 credit hours at Tech are limited to 3 pass/fail credit hours in HTS electives.

All courses in the HTS core must be taken for a letter grade and the student must earn a C or better.

One grade of D (three credits) is allowed in HTS electives.

1. This must be a different class from that used to satisfy the Legislative Requirement.
2. Any HTS course that carries a Social Science attribute.
3. Minimum grade of C required.
4. 12 credits required in either the same prefix or part of a coherent theme. Please consult with advisor on course selection.
5. Free Electives and Non-Major Cluster electives can be satisfied with a minor, certificate, or other coursework. Please consult with the advisor on course selection.
6. In consultation with an advisor, students choose three HTS classes with a coherent theme that is not reflected in the other seven pre-approved areas of specialization.
7. Please see an advisor for additional Math sequence options for Core D Math requirement.
8. Sequence of two classes in the same language. Classes must be taught in a language other than English.

International Plan

This degree program combines the traditional benefits of an HTS degree with the additional benefits of international education. The School of History and Sociology strongly encourages study abroad programs and believes that international experiences greatly enhance one's undergraduate education.

The number of credit hours needed for this degree (BS in History, Technology, and Society-International Plan, or BSHTS-IP) is the same as for the traditional bachelor's degree in HTS. However, the International Plan (IP) degree has different requirements. These requirements are discussed briefly in the next paragraph. In most cases, HTS majors will be able to use their non-major cluster and free-elective hours to fulfill the HTS-IP requirements.

There are two IP tracks:

- the English Language Option and
- the Foreign Language Option.

The HTS degree supports both options, which the Institute deems to be equal in difficulty and value. Both tracks require a total of twenty-six weeks in residence in a specific foreign country or region. These weeks must be accumulated in one or two trips abroad; any combination of coursework, research, internship, or work may apply to this twenty-six week total, given the approval of the advisor. Both IP tracks require a minimum of twelve credit hours in one foreign language and demonstration of proficiency in that language. Both require participants to take a cluster of courses from a menu of IP-designated electives; both require completion of a capstone course, which will be offered through the HTS degree program.

Visit the School of History and Sociology website here for additional information.

For more complete information, see the official Institute IP website through Georgia Tech's Office of International Education.

Office of International Education

Research Option

The School of History and Sociology Research Option allows students to incorporate additional research, writing, and presentation experiences into the HTS major program of study. Students interested in going on to graduate or professional school are encouraged to consider the research option, which allows a student to complete a significant scholarly work for presentation at a professional conference and/or publication.

In addition to the courses required of all HTS majors, including eight credit hours of research seminars and the three-credit HTS research methods course, students enrolled in the Research Option will also complete six hours of supervised individual undergraduate research and two 1-hour writing courses: LMC 4701 (typically taken during the first or second semester of research) and LMC 4702 (taken during the term in which the thesis is written).

Visit the School of History and Sociology website here for additional information.

BACHELOR OF SCIENCE IN INDUSTRIAL DESIGN

Undergraduate education in industrial design at Georgia Tech leads to the Bachelor of Science Degree in Industrial Design that is accredited by the National Association of Schools of Art and Design (NASAD). The undergraduate program prepares students for a career in design practice as well as for graduate education in industrial design and in other related fields. The School of Industrial Design at Georgia Tech offers the only industrial design degree program in the University System of Georgia.

Industrial design is the professional practice of creating products that enhance the function, usability, value, and appearance of products, services, systems, and experiences with the goal of benefiting the user, manufacturer, community, and the environment. Industrial design education prepares students to design systems and tangible artifacts including, consumer and recreational products, business and industrial products, medical and computer equipment, transportation and environments, as well as user experience and interfaces. Both generalist and specialist, industrial designers tend to be part artist, part entrepreneur, and part engineer.

Cross-disciplinary education is the primary focus of the four-year industrial design program. The university education provides:

1. an understanding of the arts (liberal and visual arts), technology (engineering and sciences), humanities (sociology and psychology), and management (marketing and branding),
2. a collaborative and shared education through an emphasis on the design studio, and
3. an opportunity to periodically participate in real-life design projects through sponsored studio projects.

The undergraduate program offers a well-rounded course of study with an emphasis on critical thinking, basic design, design skills, and design communication. There are 6 industrial design studios after the first-year suite of introductory design classes. The industrial design studios focus on a sequential learning path which begins with form making to product design to post design that involves development and manufacturing. Design projects stress developing a broad education through an exposure to academic and professional considerations. The School encourages students to develop a diverse background in order to expand individual talents and respond to emerging opportunities in the field. Faculty members are scholars and design practitioners, giving students the opportunity to learn about both.

The faculty reserves the right to refuse credit for any project executed outside the precincts of the College or otherwise executed without proper coordination with the instructor.

Grade Requirements

All required industrial design courses must be completed with a grade of C or higher. A student may not enter a more advanced studio design course until this requirement is met; students with such academic deficiencies may be required to delay their studies for one year. Studio design courses must be taken in sequence beginning fall semester. A maximum of 9 credit hours may be taken on a pass/fail basis. Only courses taken as free electives in the undergraduate curriculum maybe taken for pass/fail credit. See "Information for Undergraduate Students" for Institute regulations regarding pass/fail courses.

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1315	Introduction to Media Computation	3
Core C - Humanities		
Any HUM		3
ID 2242	History of Art 2	3
Core D - Science, Math, & Technology		
Lab Science		4
PHYS 2211	Introductory Physics I [1]	4
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
ID 1011	Industrial Design Fundamentals 1	2
ID 1012	Industrial Design Fundamentals 2	2
ID 1101	Introduction to Industrial Design 1	1
ID 1102	Introduction to Industrial Design 2	1
ID 1401	Introduction to Graphic Communications 1	1
ID 1402	Introduction to Graphic Communications 2	1
ID 1418	Introduction to Sketching and Modeling 1	1
ID 1419	Introduction to Sketching and Modeling 2	1
ID 2024	Industrial Design Studio 2	3
ID 2023	Industrial Design Studio 1	3
Major Requirements		
ID 2101	Digital Design Methods	3
ID 2102	3D Modeling	2
ID 2202	History of Modern Industrial Design	3
ID 2320	Human Factors in Design	3
ID 2325	User Centered Design Methods	3
ID 2510	Introduction to Smart Product Design	3
ID 3031	Health Design Studio 1	4
or ID 3041	Product Development Studio 1	
or ID 3051	Interactive Product Design Studio 1	
ID 3032	Health Design Studio 2	4
or ID 3042	Product Development Studio 2	

or ID 3052	Interactive Product Design Studio 2	
ID 3301	Materials I: Renewables	3
ID 3302	Materials and Processes II: Nonrenewables	3
ID 4061	ID Capstone Design Studio 1	4
or ID 4071	Invention Studio 1	
or ID 4081	ID/ME Collaborative Design Studio 1	
ID 4062	ID Capstone Design Studio 2	4
or ID 4072	Invention Studio 2	
or ID 4082	ID/ME Collaborative Design Studio 2	
ID 3320	Design Methods: User Centered Design	3
ID 4206	Culture of Objects: A Seminar on the Design and Culture of Objects	3
Departmental Electives		
Any ID course		12
Free Electives		
Free Electives		12
Total Credit Hours		**130**

Pass-fail only allowed for Free Electives.

[1] If PHYS 2231 (5 credit hours) is taken, excess hour applies to Free Electives.

International Plan

The International Plan offers a challenging academic program that develops global competence within the context of Industrial Design.

The International Plan is a four-year program that builds global competence by requiring students to spend two full terms at an Industrial Design program in another country, to develop a proficiency in a second language, and to take internationally oriented coursework. This experience provides students a deeper global competency than traditional international opportunities. The eight-semester sequence is structured to allow for the Fall and Spring third year semester to be completed at an industrial design program in another country. Students are responsible for locating those courses at the host institution that will serve as equivalents to the courses listed in the curriculum.

Degree requirements are not modified but are satisfied with specialized courses and appropriate choices of elective courses, which includes globally focused courses within the major area and a capstone Senior Studio: Global Awareness. Consult with the Industrial Design Program for the suggested curriculum.

All International Plan participants must develop proficiency in a language other than English. Unless otherwise approved, the language chosen to fulfill this requirement will have a relationship to the country or region in which the student plans to fulfill the 26 week requirement. Any variance will require approval from the IP faculty representative and the IP Committee.

Admission Requirements

- Applicants must be undergraduate degree-seeking Georgia Tech students in one of the participating majors.
- Students must submit an application via the International Plan website. Notification of acceptance will be communicated via the student's Georgia Tech e-mail address.
- There is no GPA requirement for first-semester freshmen applying to the International Plan. All other applicants must have at least a 2.5 GPA at the time of application.

International Plan

Industrial Design International Studies

BACHELOR OF SCIENCE IN INDUSTRIAL ENGINEERING

The principal strength of the academic program leading to the Bachelor of Science in Industrial Engineering (BS IE) is its blend of mathematics, physical sciences and business applications. The methodology foundation is built on probability, optimization, statistics, computing, and economics. The program features a unique concentration system that allows students to get a broad industrial engineering education and to specialize in areas such as

- Advanced Studies in Operations Research and Statistics,
- Analytics and Data Science,
- Economic and Financial Systems,
- Operations Research,
- Quality and Statistics,
- Supply Chain Engineering, and
- General Industrial Engineering.

This blend produces the flexibility that is inherent in the field of industrial and systems engineering, and that affords BSIE graduates a wide array of career options. Our graduates are constantly looking for ways to make anything in life work better, more efficiently and more productively.

Program Educational Objectives

The H. Milton Stewart School of Industrial and Systems Engineering expects our graduates (in 3 to 6 years):

- to become successful Industrial Engineers;
- to take leadership in their endeavors;
- to be self-learners and starters;
- to succeed in professional and educational advancement.

- Bachelor of Science in Industrial Engineering - Advanced Studies in Operations Research and Statistics
- Bachelor of Science in Industrial Engineering - Analytics and Data Science
- Bachelor of Science in Industrial Engineering - General
- Bachelor of Science in Industrial Engineering - Economic and Financial Systems
- Bachelor of Science in Industrial Engineering - Operations Research
- Bachelor of Science in Industrial Engineering - Quality and Statistics
- Bachelor of Science in Industrial Engineering - Supply Chain Engineering

Cooperative Plan

The Co-op Program enhances the student's education, employability and earnings potential. For more details, visit co-op pages from Georgia Tech's co-op Website.

- Co-op courses are designated in the schedule of classes as co-op. All students interested in registering for this course(s) must have been accepted into the co-op Program. Students must have met with their co-op advisor to be issued a permit to register for restricted course(s). Students must register for the co-op course every semester they are at work in order to receive credit for the work term.
- Students who are in the Co-op Program (U.S. citizens and Permanent Residents) and are returning to work should automatically receive a permit but are advised to remain in close contact with their co-op advisor.
- International students must receive work authorization from the Office of International Education prior to each work term before a course registration permit will be issued.
- Neither co-op nor internship courses count for credit towards the industrial engineering degree; however, successful completion of the Co-op Program leads to a degree designator.

For more information about all of the programs in the Center for Career Discovery and Development, visit Center for Career Discovery and Development.

International Plan

The Georgia Tech International Plan is designed to prepare graduates to develop significant global competence. Many Industrial Engineers work in consulting companies, supply chain, economic decision systems, etc. Global perspectives are very important. The significant global competence will give them an additional advantage on the job market and on the jobs.

The major components of International Plan include

1. Twenty six weeks of international experience (work, research or study)
2. Foreign language requirements. This can be satisfied by oral proficiency measured tested by an exam by the American Council for the Teaching of Foreign Languages (ACTFL). The foreign language requirement can also be satisfied by course work. It means the passing of two 2XXX level language classes.
3. Three internationally oriented courses plus an addendum in the capstone design on international perspective.

For more details of the International Plan, including application materials, visit the Office of International Education. Please also see The International Plan Option in ISyE.

BS/MS Options

The School of Industrial and Systems Engineering offers the following options for eligible students to double count a maximum of 6 credit hours toward an undergraduate degree and graduate degree:

BS in Industrial Engineering/MS in Supply Chain Engineering - contact School of more information

BS in Industrial Engineering/MS in Industrial Engineering

BS in Industrial Engineering/MS in Health Systems

BS in Industrial Engineering/MS in Operations Research

Bachelor of Science in Industrial Engineering - Analytics and Data Science

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [1]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus [1]	2
MATH 1553	Introduction to Linear Algebra [1,2]	2
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
ECON 2100	Economic Analysis and Policy Problems	3
PSYC 1101	General Psychology	3
Any SS		3
Core F - Courses Related to Major		
CS 2316	Data Manipulation for Science and Industry	3
CS 4400	Introduction to Database Systems	3
MATH 2551	Multivariable Calculus [1,2]	4
Lab Science [3]		8
Ethics Requirement [4]		
Environmental Requirement [5]		
Major Requirements		
ACCT 2101	Accounting I: Financial Accounting	3
or MGT 300	Financial and Managerial Accounting	
MATH 2603	Introduction to Discrete Mathematics [1]	4
ISYE 2027	Probability with Applications	3
ISYE 3030	Basic Statistical Methods	3
ISYE 3025	Essentials of Engineering Economy	1
ISYE 3044	Simulation Analysis and Design	3
ISYE 3133	Engineering Optimization	3
ISYE 3232	Stochastic Manufacturing and Service Systems	3
ISYE 4031	Regression and Forecasting	3
ISYE 4106	Senior Design	4
Engineering Electives [6,7]		
Select one of the following:		3
ECE 2020	Digital System Design	
ECE 2026	Introduction to Signal Processing	
ECE 3710 & ECE 3741	Circuits and Electronics and Instrumentation and Electronics Lab	
Select 6 credits of the following: [8]		6
Group 1		
AE 2220	Dynamics	
AE 3450	Thermodynamics and Compressible Flow	
BMED 3100	Systems Physiology	
CHBE 2100	Chemical Process Principles	
CHBE 2110	Chemical Engineering Thermodynamics I	
CHBE 4763	Pulping and Chemical Recovery	
CHBE 4764	Bleaching and Papermaking	
COE 2001	Statics	
COE 3001	Mechanics of Deformable Bodies	
CEE 2040	Dynamics	
CEE 2300	Environmental Engineering Principles	
CEE 3010	Geomatics	
CEE 4100	Construction Engineering and Management	
CEE 4300	Environmental Engineering Systems	
CEE 4600	Transportation Planning, Operations, and Design	
CS 2110	Computer Organization and Programming	
CS 4641	Machine Learning	
CX 4010	Computational Problem Solving for Scientists and Engineers	
CX 4240	Introduction to Computing for Data Analysis	
CX 4242	Data and Visual Analytics	
ECE 2020	Digital System Design	
ECE 2026	Introduction to Signal Processing	
ECE 2040	Circuit Analysis	
ECE 3035	Mechanisms for Computing Systems	
ECE 3076	Computer Communications	
ECE 3090	Software Fundamentals for Engineering Systems	
ECE 3710	Circuits and Electronics	
ECE 3741	Instrumentation and Electronics Lab	
ECE 4606	Wireless Communications	
ME 2202	Dynamics of Rigid Bodies	
ME 3015	System Dynamics and Control	
ME 3322	Thermodynamics	
ME 3720	Introduction to Fluid and Thermal Engineering	
ME 4763	Pulping and Chemical Recovery	
ME 4764	Bleaching and Papermaking	
MSE 2001	Principles and Applications of Engineering Materials	
MSE 3012	Thermal and Transport Properties of Materials	
MSE 3015	Electrical, Optical, and Magnetic Properties	
NRE 3301	Radiation Physics	

Group 2 [9]		
AE 4370	Life Cycle Cost Analysis	
AE 4701	Wind Engineering	
AE 4793	Composite Materials and Processes	
ARCH 6271	Healthcare Design of the Future	
BIOS 2400	Math Models in Biology	
BIOS 4740	Biologically-Inspired Design	
BMED 2300	Problems in Biomedical Engineering II	
BMED 3400	Introduction to Biomechanics	
BMED 4751	Introduction to Biomaterials	
CHBE 4793	Composite Materials and Processes	
COE 3002	Intro to Microelectronics and Nanotechnology Revolution	
CEE 4225	Introduction to Coastal Engineering	
CEE 4330	Air Pollution Engineering	
CEE 4793	Composite Materials and Processes	
CP 4310	Urban Transportation and Planning	
CP 4510	Fundamentals of Geographic Information Systems	
ECE 2031	Digital Design Laboratory	
ECE 4755	Electronic Packaging Substrate Fabrication	
ME 2110	Creative Decisions and Design	
ME 3057	Experimental Methodology and Technical Writing	
ME 4740	Biologically Inspired Design	
ME 4793	Composite Materials and Processes	
MSE 2021	Materials Characterization	
MSE 3720	Introduction to Polymer/Fiber Enterprise	
MSE 4751	Introduction to Biomaterials	
MSE 4755	Electronic Packaging Substrate Fabrication	
MSE 4793	Composite Materials and Processing	
Analytics and Data Science Concentration [10]		
Group A:		3
ISYE 4133	Advanced Optimization	
ISYE 4232	Advanced Stochastic Systems	
ISYE 4045	Advanced Simulation	
ISYE 4134	Constraint Programming	
Group B:		6
ISYE 4034	Decision and Data Analytics	
CX 4240	Introduction to Computing for Data Analysis	
ISYE 4803	Special Topics (Intro to Machine Learning)	
or CS 4641	Machine Learning	
ISYE 4803	Special Topics (On-Line Learning and Decision Making)	
ISYE 4803	Special Topics (Nonlin Opt: App to ML&Eng)	
ISYE 4803	Special Topics (Foundations of Modern Data Sci)	
Analytics Breadth Electives:		6
ECON 3150	Economic and Financial Modeling	
ECON 4340	Economics of Industrial Competition	
ECON 4350	International Economics	
ISYE 3039	Methods of Quality Improvement	
ISYE 3103	Introduction to Supply Chain Modeling: Logistics	
ISYE 3104	Introduction to Supply Chain Modeling: Manufacturing and Warehousing	
ISYE 3106	Cornerstone Design for Industrial Engineers	
ISYE 4111	Advanced Supply Chain Logistics	
ISYE 4301	Supply Chain Economics	
ISYE 4311	Capital Investment Analysis	
ISYE 4803	Special Topics (Advanced Manufacturing)	
ISYE 4803	Special Topics (Design of Experiments)	
ISYE 4803	Special Topics (Facility Layout and Warehousing)	
ISYE 4803	Special Topics (Health Systems Engineering)	
ISYE 4803	Special Topics (Reliability Engineering)	
ISYE 4803	Special Topics (Systems Design for IEs)	
MATH 4262	Mathematical Statistics II	
MGT 3078	Finance and Investments	
Free Electives [11]		
Free Electives		11
Total Credit Hours		**128**

Pass-fail only allowed for Free Electives, Humanities, and the Social Sciences elective.

Students must achieve a minimum GPA of 2.0 in the BSIE Major Requirements to graduate.

1 Students must earn a C or better in all required MATH courses in the BSIE curriculum.

2 Students may also complete MATH 1554 and MATH 2550 to satisfy math requirements. If MATH 1554/MATH 2550 combination is taken, then two hours from MATH 1554 may be used in Area F to give Area F 18 hours.

3 Only one EAS course can be used toward ISYE Lab Science requirements.

4 PSYC 1101 will satisfy the Ethics requirement.

5 Students must choose from the following to meet the Environmental requirement: BIOS 1107 and BIOS 1107L, BIOS 2300, CEE 2300, CEE 4300,EAS 1600, EAS 1601, EAS 2600, EAS 2750, EAS 3110, EAS 4480,ECON 4440, ISYE 4803 titled "Energy and Environmental Analysis," ISYE 4501, SLS 3120, or PHYS 2750.

6 Students must take at least nine credits of engineering electives. Three credits must be chosen from ECE 2020, ECE 2026, or ECE 3710 AND ECE 3741. Students must complete courses from two different eligible engineering elective subjects. Engineering elective credits taken in excess of the nine required may count toward free electives.

7 At most, one computing course (CS or CX) is allowed, including courses cross-listed with CS or CX courses.

8 In addition to the ECE requirement, take at least two additional credits from Group 1 and no more than four credits from Group 2.

9 To count as Group 2 Engineering Elective credit, all Vertically-Integrated Projects (VIP) courses must be approved by the ISyE Associate Undergraduate Chair, and at least three but no more than four credits of VIP coursework may count toward the Engineering Elective requirement.

10 Students must complete five concentration courses: one from Group A, two from Group B, and two as listed from any other concentration. A minimum of four of the five concentration courses must be ISYE

[11] courses. If ISYE 3106 Cornerstone Design is taken as a breadth elective, it must be taken prior to ISYE 4106 Senior Design.
MATH 1113, MGT 2250, ISYE 3770, and PHYS 2XXX (AP credit) not allowed.

Bachelor of Science in Industrial Engineering - Quality and Statistics

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [1]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus [1]	2
MATH 1553	Introduction to Linear Algebra [1,2]	2
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
ECON 2100	Economic Analysis and Policy Problems	3
PSYC 1101	General Psychology	3
Any SS		3
Core F - Courses Related to Major		
CS 2316	Data Manipulation for Science and Industry	3
CS 4400	Introduction to Database Systems	3
MATH 2551	Multivariable Calculus [1,2]	4
Lab Science [3]		8
Ethics Requirement [4]		
Environmental Requirement [5]		
Major Requirements		
ACCT 2101	Accounting I: Financial Accounting	3
or MGT 300	Financial and Managerial Accounting	
MATH 2603	Introduction to Discrete Mathematics [1]	4
ISYE 2027	Probability with Applications	3
ISYE 3030	Basic Statistical Methods	3
ISYE 3025	Essentials of Engineering Economy	1
ISYE 3133	Engineering Optimization	3
ISYE 3232	Stochastic Manufacturing and Service Systems	3
ISYE 3044	Simulation Analysis and Design	3
ISYE 4031	Regression and Forecasting	3
ISYE 4106	Senior Design	4
Engineering Electives [6]		
Select one of the following:		3
ECE 2020	Digital System Design	
ECE 2026	Introduction to Signal Processing	
ECE 3710 & ECE 3741	Circuits and Electronics and Instrumentation and Electronics Lab	
Select 6 credits of the following: [7,8]		6
Group 1		
AE 2220	Dynamics	
AE 3450	Thermodynamics and Compressible Flow	
BMED 3100	Systems Physiology	
CHBE 2100	Chemical Process Principles	
CHBE 2110	Chemical Engineering Thermodynamics I	
CHBE 4763	Pulping and Chemical Recovery	
CHBE 4764	Bleaching and Papermaking	
COE 2001	Statics	
COE 3001	Mechanics of Deformable Bodies	
CEE 2040	Dynamics	
CEE 2300	Environmental Engineering Principles	
CEE 3010	Geomatics	
CEE 4100	Construction Engineering and Management	
CEE 4300	Environmental Engineering Systems	
CEE 4600	Transportation Planning, Operations, and Design	
CS 2110	Computer Organization and Programming	
CS 4641	Machine Learning	
CX 4010	Computational Problem Solving for Scientists and Engineers	
CX 4240	Introduction to Computing for Data Analysis	
CX 4242	Data and Visual Analytics	
ECE 2020	Digital System Design	
ECE 2026	Introduction to Signal Processing	
ECE 2040	Circuit Analysis	
ECE 3035	Mechanisms for Computing Systems	
ECE 3076	Computer Communications	
ECE 3090	Software Fundamentals for Engineering Systems	
ECE 3710	Circuits and Electronics	
ECE 3741	Instrumentation and Electronics Lab	
ECE 4606	Wireless Communications	
ME 2202	Dynamics of Rigid Bodies	
ME 3015	System Dynamics and Control	
ME 3322	Thermodynamics	
ME 3720	Introduction to Fluid and Thermal Engineering	
ME 4763	Pulping and Chemical Recovery	
ME 4764	Bleaching and Papermaking	
MSE 2001	Principles and Applications of Engineering Materials	

MSE 3012	Thermal and Transport Properties of Materials	
MSE 3015	Electrical, Optical, and Magnetic Properties	
NRE 3301	Radiation Physics	
Group 2: [9]		
AE 4370	Life Cycle Cost Analysis	
AE 4701	Wind Engineering	
AE 4793	Composite Materials and Processes	
ARCH 6271	Healthcare Design of the Future	
BIOS 2400	Math Models in Biology	
BIOS 4740	Biologically-Inspired Design	
BMED 2300	Problems in Biomedical Engineering II	
BMED 3400	Introduction to Biomechanics	
BMED 4751	Introduction to Biomaterials	
CHBE 4793	Composite Materials and Processes	
COE 3002	Intro to Microelectronics and Nanotechnology Revolution	
CEE 4225	Introduction to Coastal Engineering	
CEE 4330	Air Pollution Engineering	
CEE 4793	Composite Materials and Processes	
CP 4310	Urban Transportation and Planning	
CP 4510	Fundamentals of Geographic Information Systems	
ECE 2031	Digital Design Laboratory	
ECE 4755	Electronic Packaging Substrate Fabrication	
ISYE 4740	Bio-Inspired Design	
MATH 4755	Mathematical Biology	
ME 2110	Creative Decisions and Design	
ME 3057	Experimental Methodology and Technical Writing	
ME 4740	Biologically Inspired Design	
ME 4793	Composite Materials and Processes	
MSE 2021	Materials Characterization	
MSE 3720	Introduction to Polymer/Fiber Enterprise	
MSE 4751	Introduction to Biomaterials	
MSE 4755	Electronic Packaging Substrate Fabrication	
MSE 4793	Composite Materials and Processing	
Quality and Statistics Concentration [10]		
Depth Electives		
ISYE 3039	Methods of Quality Improvement	3
ISYE 4803	Special Topics (Design of Experiments)	3
Select one from:		3
ISYE 4034	Decision and Data Analytics	
ISYE 4803	Special Topics (Reliability Engineering)	
MATH 4262	Mathematical Statistics II	
CS 4641	Machine Learning	
CX 4240	Introduction to Computing for Data Analysis	
CX 4242	Data and Visual Analytics	
Breadth Electives (select two of the following):		6
ECON 3150	Economic and Financial Modeling	
ECON 4340	Economics of Industrial Competition	
ECON 4350	International Economics	
ISYE 3103	Introduction to Supply Chain Modeling: Logistics	
ISYE 3104	Introduction to Supply Chain Modeling: Manufacturing and Warehousing	
ISYE 3106	Cornerstone Design for Industrial Engineers	
ISYE 4045	Advanced Simulation	
ISYE 4111	Advanced Supply Chain Logistics	
ISYE 4133	Advanced Optimization	
ISYE 4301	Supply Chain Economics	
ISYE 4232	Advanced Stochastic Systems	
ISYE 4311	Capital Investment Analysis	
ISYE 4501	Energy, Efficiency, and Sustainability	
ISYE 4803	Special Topics (Advanced Manufacturing)	
ISYE 4803	Special Topics (Facility Layout and Warehousing)	
ISYE 4803	Special Topics (Linear and Convex Optimization)	
MGT 3078	Finance and Investments	
Free Electives [11]		
Free Electives		11
Total Credit Hours		**128**

Pass-fail only allowed for Free Electives, Humanities, and the Social Sciences elective.

Students must achieve a minimum GPA of 2.0 in the BSIE Major Requirements to graduate.

1. Students must earn a C or better in all required MATH courses in the BSIE curriculum.
2. Students may also complete MATH 1554 and MATH 2550 to satisfy math requirements. If MATH 1554/MATH 2550 combination is taken, then two hours from MATH 1554 may be used in Area F to give Area F 18 hours.
3. Only one EAS course can be used toward ISYE Lab Science requirements.
4. PSYC 1101 will satisfy the Ethics requirement.
5. Students must choose from the following to meet the Environmental requirement: BIOS 1107 and BIOS 1107L, BIOS 2300, CEE 2300, CEE 4300, EAS 1600, EAS 1601, EAS 2600, EAS 2750, EAS 3110, EAS 4480, ECON 4440, ISYE 4803 titled "Energy and Environmental Analysis," ISYE 4501, SLS 3120, or PHYS 2750.
6. Students must complete courses from two different eligible engineering elective subjects.
7. At most, one computing course (CS or CX) is allowed, including courses cross-listed with CS or CX courses.
8. Students must take at least 9 credits of engineering electives. Three credits must be chosen from ECE 2020, ECE 2026, or ECE 3710/ECE 3741. For the remaining 6 credits, at least 2 credits must be from Group 1.
9. To count toward the Engineering Elective Group 2 requirement, all Vertically-Integrated Projects (VIP) courses must be approved by the ISyE Undergraduate Associate Chair. And, at least three, but no more than four, credits of VIP coursework may count toward the Engineering Elective requirement.
10. Students must complete 5 concentration courses: 3 depth courses and 2 breadth courses. A minimum of 4 of the 5 required concentration courses must be ISYE courses. If ISYE 3106 Cornerstone Design is taken as a breadth elective, it must be taken prior to ISYE 4106 Senior Design.

[11] MATH 1113, MGT 2250, ISYE 3770, and PHYS 2XXX (AP credit) not allowed.

Bachelor of Science in Industrial Engineering - Advanced Studies in Operations Research and Statistics

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [1]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus [1]	2
MATH 1553	Introduction to Linear Algebra [1,2,3]	2
or MATH 1554	Linear Algebra	
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
ECON 2100	Economic Analysis and Policy Problems	3
PSYC 1101	General Psychology	3
Any SS		3
Core F - Courses Related to Major		
CS 2316	Data Manipulation for Science and Industry	3
CS 4400	Introduction to Database Systems	3
MATH 2551	Multivariable Calculus [1,2]	4
or MATH 2561	Introduction to Multivariable Calculus	
or MATH 2567	Honors Multivariable Calculus	
MATH 2106	Foundations of Mathematical Proof	3
ISYE 3025	Essentials of Engineering Economy	1
Lab Science [5]		4
Ethics Requirement [6]		
Environmental Requirement [7]		
Major Requirements		
ACCT 2101	Accounting I: Financial Accounting	3
or MGT 3001	Financial and Managerial Accounting	
MATH 3012	Applied Combinatorics	3
MATH 3406	A Second Course in Linear Algebra	3
ISYE 2027	Probability with Applications	3
ISYE 3030	Basic Statistical Methods	3
ISYE 3133	Engineering Optimization	3
ISYE 3232	Stochastic Manufacturing and Service Systems	3
ISYE 3044	Simulation Analysis and Design	3
ISYE 4031	Regression and Forecasting	3
ISYE 4106	Senior Design	4
Engineering Electives [8,9]		
Select one of the following:		3
ECE 2020	Digital System Design	
ECE 2026	Introduction to Signal Processing	
ECE 3710 & ECE 3741	Circuits and Electronics and Instrumentation and Electronics Lab	
Select at least 5 credits of the following: [10]		5
Group 1		
AE 2220	Dynamics	
AE 3450	Thermodynamics and Compressible Flow	
BMED 3100	Systems Physiology	
CHBE 2100	Chemical Process Principles	
CHBE 2130	Chemical Engineering Thermodynamics I	
CHBE 4763	Pulping and Chemical Recovery	
CHBE 4764	Bleaching and Papermaking	
COE 2001	Statics	
COE 3001	Mechanics of Deformable Bodies	
CEE 2040	Dynamics	
CEE 2300	Environmental Engineering Principles	
CEE 3010	Geomatics	
CEE 4100	Construction Engineering and Management	
CEE 4300	Environmental Engineering Systems	
CEE 4600	Transportation Planning, Operations, and Design	
CS 2110	Computer Organization and Programming	
CS 4641	Machine Learning	
CS 6505	Computability, Algorithms, and Complexity	
CX 4010	Computational Problem Solving for Scientists and Engineers	
CX 4240	Introduction to Computing for Data Analysis	
CX 4242	Data and Visual Analytics	
ECE 2020	Digital System Design	
ECE 2026	Introduction to Signal Processing	
ECE 2040	Circuit Analysis	
ECE 3035	Mechanisms for Computing Systems	
ECE 3076	Computer Communications	
ECE 3090	Software Fundamentals for Engineering Systems	
ECE 3710	Circuits and Electronics	
ECE 3741	Instrumentation and Electronics Lab	
ECE 4606	Wireless Communications	

ECE 4823	Special Topics (Game Theory and Multiagent Systems)	
ME 2202	Dynamics of Rigid Bodies	
ME 3015	System Dynamics and Control	
ME 3322	Thermodynamics	
ME 3720	Introduction to Fluid and Thermal Engineering	
ME 4763	Pulping and Chemical Recovery	
ME 4764	Bleaching and Papermaking	
MSE 2001	Principles and Applications of Engineering Materials	
MSE 3012	Thermal and Transport Properties of Materials	
MSE 3015	Electrical, Optical, and Magnetic Properties	
NRE 3301	Radiation Physics	
Group 2 [11]		
AE 4370	Life Cycle Cost Analysis	
AE 4701	Wind Engineering	
AE 4793	Composite Materials and Processes	
ARCH 6271	Healthcare Design of the Future	
BIOS 2400	Math Models in Biology	
BIOS 4740	Biologically-Inspired Design	
BMED 2300	Problems in Biomedical Engineering II	
BMED 3400	Introduction to Biomechanics	
BMED 4751	Introduction to Biomaterials	
CHBE 4793	Composite Materials and Processes	
COE 3002	Intro to Microelectronics and Nanotechnology Revolution	
CEE 4225	Introduction to Coastal Engineering	
CEE 4330	Air Pollution Engineering	
CEE 4793	Composite Materials and Processes	
CP 4310	Urban Transportation and Planning	
CP 4510	Fundamentals of Geographic Information Systems	
ECE 2031	Digital Design Laboratory	
ECE 4755	Electronic Packaging Substrate Fabrication	
ISYE 4740	Bio-Inspired Design	
MATH 4755	Mathematical Biology	
ME 2110	Creative Decisions and Design	
ME 3057	Experimental Methodology and Technical Writing	
ME 4740	Biologically Inspired Design	
ME 4793	Composite Materials and Processes	
MSE 2021	Materials Characterization	
MSE 3720	Introduction to Polymer/Fiber Enterprise	
MSE 4751	Introduction to Biomaterials	
MSE 4755	Electronic Packaging Substrate Fabrication	
MSE 4793	Composite Materials and Processing	
Advanced Studies in Operations Research & Statistics Concentration [12]		
ISYE 8813	Special Topics in Operations Research (Must have title Math of Operations Research)	3
or MATH 4377	Analysis I	
Select two of the following: [13]		6
ISYE 4133	Advanced Optimization	
ISYE 4232	Advanced Stochastic Systems	
ISYE 6661	Linear Optimization	
ISYE 6662	Discrete Optimization	
ISYE 6663	Nonlinear Optimization	
ISYE 6664	Stochastic Optimization	
ISYE 6761	Stochastic Processes I	
ISYE 6412	Theoretical Statistics	
Select two of the following:		6
ISYE 3103	Introduction to Supply Chain Modeling: Logistics	
ISYE 3104	Introduction to Supply Chain Modeling: Manufacturing and Warehousing	
ISYE 3106	Cornerstone Design for Industrial Engineers	
ISYE 3039	Methods of Quality Improvement	
ISYE 4034	Decision and Data Analytics	
ISYE 4045	Advanced Simulation	
ISYE 4111	Advanced Supply Chain Logistics	
ISYE 4134	Constraint Programming	
ISYE 4301	Supply Chain Economics	
ISYE 4311	Capital Investment Analysis	
ISYE 4501	Energy, Efficiency, and Sustainability	
ISYE 4803	Special Topics (Advanced Manufacturing)	
ISYE 4803	Special Topics (Facility Layout and Warehousing)	
ISYE 4803	Special Topics (Health Systems Engineering)	
ISYE 4803	Special Topics (Introduction to Machine Learning)	
ISYE 4803	Special Topics (Online Learn/Decision Making)	
ISYE 4803	Special Topics (Reliability Engineering)	
ISYE 4803	Special Topics (Systems Design for IEs)	
Free Electives [14]		
Free Electives		11
Total Credit Hours		**128**

Pass-fail only allowed for Free Electives, Humanities, and the Social Sciences elective.

Students must achieve a minimum GPA of 3.3 in the BSIE Major Requirements to graduate (Math beyond Calculus, BSIE required courses and concentration electives).

1. Students must earn a C or better in all required MATH courses in the BSIE curriculum.
2. MATH 1564 is preferred, but not required.
3. Students may also complete MATH 1554 or MATH 1564 and MATH 2550 to satisfy math requirements. If MATH 1554 or MATH 1564/MATH 2550 combination is taken, then two hours from MATH 1554 may be used in Area F to give Area F 18 hours.
4. Minimum grade of B in MATH 2106 is required to pursue the Advanced Studies for OR & Stat Concentration.
5. Only one EAS course can be used toward ISYE Lab Science Requirements.
6. PSYC 1101 will satisfy the Ethics requirement.

7 Students must choose from the following to meet the Environmental requirement: BIOS 1107 and BIOS 1107L, BIOS 2300, CEE 2300, CEE 4300,EAS 1600, EAS 1601, EAS 2600, EAS 2750, EAS 3110, EAS 4480,ECON 4440, ISYE 4803 titled "Energy and Environmental Analysis," ISYE 4501, SLS 3120, or PHYS 2750.

8 Students must complete courses from two different eligible engineering elective subjects.

9 At most, one computing course (CS or CX) is allowed, including courses cross-listed with CS or CX courses.

10 In addition to the three-credit ECE requirement, take at least one additional credit from Group 1 and no more than four credits from Group 2.

11 To count toward the Engineering Elective Group 2 requirement, all Vertically-Integrated Projects (VIPS) courses must be approved by the ISyE Associate Chair. And, at least three, but no more than four, credits of VIP coursework may count toward the Engineering Elective requirement.

12 Students must complete five concentration courses: A minimum of four of the five concentration courses must be ISYE courses. If ISYE 3106 Cornerstone Design is taken as a breadth elective, then it must be taken prior to ISYE 4106 Senior Design.

13 The 6000-level ISYE course options are preferred, but not required.

14 MATH 1113, MGT 2250, ISYE 3770, and PHYS 2XXX (AP credit) not allowed.

Bachelor of Science in Industrial Engineering - Economic and Financial Systems

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [1]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus [1]	2
MATH 1553	Introduction to Linear Algebra [1,2]	2
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
ECON 2100	Economic Analysis and Policy Problems	3
PSYC 1101	General Psychology	3
Any SS		3
Core F - Courses Related to Major		
CS 2316	Data Manipulation for Science and Industry	3
CS 4400	Introduction to Database Systems	3
MATH 2551	Multivariable Calculus [1,2]	4
Lab Science [3]		8
Ethics Requirement [4]		
Environmental Requirement [5]		
Major Requirements		
ACCT 2101	Accounting I: Financial Accounting	3
or MGT 300	Financial and Managerial Accounting	
MATH 2603	Introduction to Discrete Mathematics [1]	4
ISYE 2027	Probability with Applications	3
ISYE 3030	Basic Statistical Methods	3
ISYE 3025	Essentials of Engineering Economy	1
ISYE 3133	Engineering Optimization	3
ISYE 3232	Stochastic Manufacturing and Service Systems	3
ISYE 3044	Simulation Analysis and Design	3
ISYE 4031	Regression and Forecasting	3
ISYE 4106	Senior Design	4
Engineering Electives [6]		
Select one of the following:		3
ECE 2020	Digital System Design	
ECE 2026	Introduction to Signal Processing	
ECE 3710 & ECE 3741	Circuits and Electronics and Instrumentation and Electronics Lab	
Select 6 credits of the following: [7,8]		6
Group 1:		
AE 2220	Dynamics	
AE 3450	Thermodynamics and Compressible Flow	
BMED 3100	Systems Physiology	
CHBE 2100	Chemical Process Principles	
CHBE 2110	Chemical Engineering Thermodynamics I	
CHBE 4763	Pulping and Chemical Recovery	
CHBE 4764	Bleaching and Papermaking	
COE 2001	Statics	
COE 3001	Mechanics of Deformable Bodies	
CEE 2040	Dynamics	
CEE 2300	Environmental Engineering Principles	
CEE 3010	Geomatics	
CEE 4100	Construction Engineering and Management	
CEE 4300	Environmental Engineering Systems	
CEE 4600	Transportation Planning, Operations, and Design	
CS 2110	Computer Organization and Programming	
CS 4641	Machine Learning	
CX 4010	Computational Problem Solving for Scientists and Engineers	

CX 4240	Introduction to Computing for Data Analysis
CX 4242	Data and Visual Analytics
ECE 2020	Digital System Design
ECE 2026	Introduction to Signal Processing
ECE 2040	Circuit Analysis
ECE 3035	Mechanisms for Computing Systems
ECE 3076	Computer Communications
ECE 3090	Software Fundamentals for Engineering Systems
ECE 3710	Circuits and Electronics
ECE 3741	Instrumentation and Electronics Lab
ECE 4606	Wireless Communications
ME 2202	Dynamics of Rigid Bodies
ME 3015	System Dynamics and Control
ME 3322	Thermodynamics
ME 3720	Introduction to Fluid and Thermal Engineering
ME 4763	Pulping and Chemical Recovery
ME 4764	Bleaching and Papermaking
MSE 2001	Principles and Applications of Engineering Materials
MSE 3012	Thermal and Transport Properties of Materials
MSE 3015	Electrical, Optical, and Magnetic Properties
NRE 3301	Radiation Physics
Group 2: [9]	
AE 4370	Life Cycle Cost Analysis
AE 4701	Wind Engineering
AE 4793	Composite Materials and Processes
ARCH 6271	Healthcare Design of the Future
BIOS 2400	Math Models in Biology
BIOS 4740	Biologically-Inspired Design
BMED 2300	Problems in Biomedical Engineering II
BMED 3400	Introduction to Biomechanics
BMED 4751	Introduction to Biomaterials
CHBE 4793	Composite Materials and Processes
COE 3002	Intro to Microelectronics and Nanotechnology Revolution
CEE 4225	Introduction to Coastal Engineering
CEE 4330	Air Pollution Engineering
CEE 4793	Composite Materials and Processes
CP 4310	Urban Transportation and Planning
CP 4510	Fundamentals of Geographic Information Systems
ECE 2031	Digital Design Laboratory
ECE 4755	Electronic Packaging Substrate Fabrication
ISYE 4740	Bio-Inspired Design
MATH 4755	Mathematical Biology
ME 2110	Creative Decisions and Design
ME 3057	Experimental Methodology and Technical Writing
ME 4740	Biologically Inspired Design
ME 4793	Composite Materials and Processes
MSE 2021	Materials Characterization
MSE 3720	Introduction to Polymer/Fiber Enterprise
MSE 4751	Introduction to Biomaterials
MSE 4755	Electronic Packaging Substrate Fabrication
MSE 4793	Composite Materials and Processing
Economic and Financial Systems Concentration [10]	
Depth Electives	
ISYE 4301	Supply Chain Economics 3
ISYE 4311	Capital Investment Analysis 3
Select one of the following:	3
ECON 3150	Economic and Financial Modeling
ECON 4340	Economics of Industrial Competition
ECON 4350	International Economics
MGT 3078	Finance and Investments
Breadth Electives (select two of the following):	6
ISYE 3039	Methods of Quality Improvement
ISYE 3103	Introduction to Supply Chain Modeling: Logistics
ISYE 3104	Introduction to Supply Chain Modeling: Manufacturing and Warehousing
ISYE 3106	Cornerstone Design for Industrial Engineers
ISYE 4045	Advanced Simulation
ISYE 4111	Advanced Supply Chain Logistics
ISYE 4133	Advanced Optimization
ISYE 4232	Advanced Stochastic Systems
ISYE 4501	Energy, Efficiency, and Sustainability
ISYE 4803	Special Topics (Advanced Manufacturing)
ISYE 4803	Special Topics (Facility Layout and Warehousing)
ISYE 4803	Special Topics (Linear and Convex Optimization)
Free Electives [11]	
Free Electives	11
Total Credit Hours	**128**

Pass-fail only allowed for Free Electives, Humanities, and the Social Sciences elective.

Students must achieve a minimum GPA of 2.0 in the BSIE Major Requirements to graduate.

1. Students must earn a C or better in all required MATH courses in the BSIE curriculum.
2. Students may also complete MATH 1554 and MATH 2550 to satisfy Math requirements. If MATH 1554/MATH 2550 combination is taken, then two hours from MATH 1554 may be used in Area F to give Area F 18 hours.
3. Only one EAS course can be used toward ISYE Lab Science requirements.
4. PSYC 1101 will satisfy the Ethics requirement.
5. Students should choose from the following for Environmental Requirement: BIOS 1107 and BIOS 1107L, BIOS 2300, CEE 2300, CEE 4300, EAS 1600, EAS 1601, EAS 2600, EAS 2750, EAS 3110, EAS 4480, ECON 4440, ISYE 4803 titled "Energy and Environmental Analysis", ISYE 4501, SLS 3120, or PHYS 2750
6. Students must complete courses from two different eligible engineering elective subjects.

7 At most, one computing course (CS or CX) is allowed, including courses cross-listed with CS or CX courses.

8 Students must take at least 9 credits of engineering electives. Three credits must be chosen from ECE 2020, ECE 2026, or ECE 3710/ECE 3741. For the remaining 6 credits, at least 2 credits must be from Group 1.

9 To count toward the Engineering Elective Group 2 requirement, all Vertically-Integrated Projects (VIP) courses must be approved by the ISyE Undergraduate Associate Chair. And, at least three, but no more than four, credits of VIP coursework may count toward the Engineering Elective requirement.

10 Students must complete 5 concentration courses: 3 depth courses and 2 breadth courses. A minimum of 4 of the 5 required concentration courses must be ISYE courses. If ISYE 3106 Cornerstone Design is taken as a breadth elective, it must be taken prior to ISYE 4106 Senior Design.

11 MATH 1113, MGT 2250, ISYE 3770, and PHYS 2XXX(AP credit) not allowed.

Bachelor of Science in Industrial Engineering - General

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [1]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus [1]	2
MATH 1553	Introduction to Linear Algebra [1,2]	2
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
ECON 2100	Economic Analysis and Policy Problems	3
PSYC 1101	General Psychology	3
Any SS		3
Core F - Courses Related to Major		
CS 2316	Data Manipulation for Science and Industry	3
CS 4400	Introduction to Database Systems	3
MATH 2551	Multivariable Calculus [1,2]	4
Lab Science [3]		8
Ethics Requirement [4]		
Environmental Requirement [5]		
Major Requirements		
ACCT 2101	Accounting I: Financial Accounting	3
or MGT 300	Financial and Managerial Accounting	
MATH 2603	Introduction to Discrete Mathematics [1]	4
ISYE 2027	Probability with Applications	3
ISYE 3030	Basic Statistical Methods	3
ISYE 3025	Essentials of Engineering Economy	1
ISYE 3133	Engineering Optimization	3
ISYE 3232	Stochastic Manufacturing and Service Systems	3
ISYE 3044	Simulation Analysis and Design	3
ISYE 4031	Regression and Forecasting	3
ISYE 4106	Senior Design	4
Engineering Electives [6]		
Select one of the following:		3
ECE 2020	Digital System Design	
ECE 2026	Introduction to Signal Processing	
ECE 3710 & ECE 3741	Circuits and Electronics and Instrumentation and Electronics Lab	
Select 6 credits of the following: [7,8]		6
Group 1:		
AE 2220	Dynamics	
AE 3450	Thermodynamics and Compressible Flow	
BMED 3100	Systems Physiology	
CHBE 2100	Chemical Process Principles	
CHBE 2110	Chemical Engineering Thermodynamics I	
CHBE 4763	Pulping and Chemical Recovery	
CHBE 4764	Bleaching and Papermaking	
COE 2001	Statics	
COE 3001	Mechanics of Deformable Bodies	
CEE 2040	Dynamics	
CEE 2300	Environmental Engineering Principles	
CEE 3010	Geomatics	
CEE 4100	Construction Engineering and Management	
CEE 4300	Environmental Engineering Systems	
CEE 4600	Transportation Planning, Operations, and Design	
CS 2110	Computer Organization and Programming	
CS 4641	Machine Learning	
CX 4010	Computational Problem Solving for Scientists and Engineers	
CX 4240	Introduction to Computing for Data Analysis	
CX 4242	Data and Visual Analytics	
ECE 2020	Digital System Design	
ECE 2026	Introduction to Signal Processing	
ECE 2040	Circuit Analysis	
ECE 3035	Mechanisms for Computing Systems	
ECE 3076	Computer Communications	

ECE 3090	Software Fundamentals for Engineering Systems
ECE 3710	Circuits and Electronics
ECE 3741	Instrumentation and Electronics Lab
ECE 4606	Wireless Communications
ME 2202	Dynamics of Rigid Bodies
ME 3015	System Dynamics and Control
ME 3322	Thermodynamics
ME 3720	Introduction to Fluid and Thermal Engineering
ME 4763	Pulping and Chemical Recovery
ME 4764	Bleaching and Papermaking
MSE 2001	Principles and Applications of Engineering Materials
MSE 3012	Thermal and Transport Properties of Materials
MSE 3015	Electrical, Optical, and Magnetic Properties
NRE 3301	Radiation Physics
Group 2: [9]	
AE 4370	Life Cycle Cost Analysis
AE 4701	Wind Engineering
AE 4793	Composite Materials and Processes
ARCH 6271	Healthcare Design of the Future
BIOS 2400	Math Models in Biology
BIOS 4740	Biologically-Inspired Design
BMED 2300	Problems in Biomedical Engineering II
BMED 3400	Introduction to Biomechanics
BMED 4751	Introduction to Biomaterials
CHBE 4793	Composite Materials and Processes
COE 3002	Intro to Microelectronics and Nanotechnology Revolution
CEE 4225	Introduction to Coastal Engineering
CEE 4330	Air Pollution Engineering
CEE 4793	Composite Materials and Processes
CP 4310	Urban Transportation and Planning
CP 4510	Fundamentals of Geographic Information Systems
ECE 2031	Digital Design Laboratory
ECE 4755	Electronic Packaging Substrate Fabrication
ISYE 4740	Bio-Inspired Design
MATH 4755	Mathematical Biology
ME 2110	Creative Decisions and Design
ME 3057	Experimental Methodology and Technical Writing
ME 4740	Biologically Inspired Design
ME 4793	Composite Materials and Processes
MSE 2021	Materials Characterization
MSE 3720	Introduction to Polymer/Fiber Enterprise
MSE 4751	Introduction to Biomaterials
MSE 4755	Electronic Packaging Substrate Fabrication
MSE 4793	Composite Materials and Processing
General Concentration [10]	
Select five from the following:	15
CS 4641	Machine Learning
CX 4010	Computational Problem Solving for Scientists and Engineers
CX 4240	Introduction to Computing for Data Analysis
CX 4242	Data and Visual Analytics
ECON 3150	Economic and Financial Modeling
ECON 4340	Economics of Industrial Competition
ECON 4350	International Economics
ISYE 3039	Methods of Quality Improvement
ISYE 3103	Introduction to Supply Chain Modeling: Logistics
ISYE 3104	Introduction to Supply Chain Modeling: Manufacturing and Warehousing
ISYE 3106	Cornerstone Design for Industrial Engineers
ISYE 4034	Decision and Data Analytics
ISYE 4045	Advanced Simulation
ISYE 4111	Advanced Supply Chain Logistics
ISYE 4133	Advanced Optimization
ISYE 4232	Advanced Stochastic Systems
ISYE 4301	Supply Chain Economics
ISYE 4311	Capital Investment Analysis
ISYE 4134	Constraint Programming
ISYE 4501	Energy, Efficiency, and Sustainability
ISYE 4803	Special Topics (Advanced Manufacturing)
ISYE 4803	Special Topics (Linear and Convex Optimization)
ISYE 4803	Special Topics (Facility Layout and Warehousing)
ISYE 4803	Special Topics (Energy, Efficiency, and Sustainability)
ISYE 4803	Special Topics (Design of Experiments)
ISYE 4803	Special Topics (Reliability Engineering)
ISYE 4803	Special Topics (Intro to Machine Learning)
ISYE 4803	Special Topics (Online Learning and Decision Making)
ISYE 4803	Special Topics (Systems Design for IEs)
MATH 4262	Mathematical Statistics II
MATH 4317	Analysis I
MGT 3078	Finance and Investments
Free Electives [11]	
Free Electives	11
Total Credit Hours	**128**

Pass-fail only allowed for Free Electives, Humanities, and the Social Sciences elective.

Students must achieve a minimum GPA of 2.0 in the BSIE Major Requirements to graduate.

1 Students must earn a C or better in all required MATH courses in the BSIE curriculum.

2 Students may also complete MATH 1554 and MATH 2550 to satisfy math requirements. If MATH 1554/MATH 2550 combination is taken, then two hours from MATH 1554 may be used in Area F to give Area F 18 hours.

3 Only one EAS course can be used toward ISYE Lab Science requirements.

4 PSYC 1101 will satisfy the Ethics requirement.

5 Students must choose from the following to meet the Environmental requirement: BIOS 1107 and BIOS 1107L, BIOS 2300 , CEE 2300, CEE 4300, EAS 1600, EAS 1601, EAS 2600,EAS 2750, EAS 3110, EAS 4480, ECON 4440, ISYE 4803 titled "Energy and Environmental Analysis," ISYE 4501, SLS 3120, or PHYS 2750.

6 Students must complete courses from two different eligible engineering elective subjects.

7 At most, one computing course (CS or CX) is allowed, including courses cross-listed with CS or CX courses.

8 Students must take at least 9 credits of engineering electives. Three credits must be chosen from ECE 2020, ECE 2026, or ECE 3710/ECE 3741. For the remaining 6 credits, at least 2 credits must be from Group 1.

9 To count toward the Engineering Elective Group 2 requirement, all Vertically-Integrated Projects (VIP) courses must be approved by the ISyE Associate Undergraduate Chair. And, at least three, but no more than four, credits of VIP coursework may count toward the Engineering Elective requirement.

10 Students must complete 5 concentration courses. A minimum of 4 of the 5 required concentration courses must be ISYE courses.Only one ISYE 4803 that is not a depth course for other concentrations is allowed unless approved by the ISyE Associate Undergraduate Chair. If ISYE 3106 Cornerstone Design is taken as a breadth elective, it must be taken prior to ISYE 4106 Senior Design.

11 MATH 1113, MGT 2250, ISYE 3770, and PHYS 2XXX (AP credit) not allowed.

Bachelor of Science in Industrial Engineering - Operations Research

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [1]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus [1]	2
MATH 1553	Introduction to Linear Algebra [1,2]	2
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
ECON 2100	Economic Analysis and Policy Problems	3
PSYC 1101	General Psychology	3
Any SS		3
Core F - Courses Related to Major		
CS 2316	Data Manipulation for Science and Industry	3
CS 4400	Introduction to Database Systems	3
MATH 2551	Multivariable Calculus [1,2]	4
Lab Science [3]		8
Ethics Requirement [4]		
Environmental Requirement [5]		
Major Requirements		
ACCT 2101	Accounting I: Financial Accounting	3
or MGT 300	Financial and Managerial Accounting	
MATH 2603	Introduction to Discrete Mathematics [1]	4
ISYE 2027	Probability with Applications	3
ISYE 3030	Basic Statistical Methods	3
ISYE 3025	Essentials of Engineering Economy	1
ISYE 3133	Engineering Optimization	3
ISYE 3232	Stochastic Manufacturing and Service Systems	3
ISYE 3044	Simulation Analysis and Design	3
ISYE 4031	Regression and Forecasting	3
ISYE 4106	Senior Design	4
Engineering Electives [6]		
Select one of the following:		3
ECE 2020	Digital System Design	
ECE 2026	Introduction to Signal Processing	
ECE 3710 & ECE 3741	Circuits and Electronics and Instrumentation and Electronics Lab	
Select 6 credits of the following: [7,8]		6
Group 1		
AE 2220	Dynamics	
AE 3450	Thermodynamics and Compressible Flow	
BMED 3100	Systems Physiology	
CHBE 2100	Chemical Process Principles	
CHBE 2110	Chemical Engineering Thermodynamics I	
CHBE 4763	Pulping and Chemical Recovery	
CHBE 4764	Bleaching and Papermaking	
COE 2001	Statics	
COE 3001	Mechanics of Deformable Bodies	
CEE 2040	Dynamics	
CEE 2300	Environmental Engineering Principles	
CEE 3010	Geomatics	
CEE 4100	Construction Engineering and Management	
CEE 4300	Environmental Engineering Systems	
CEE 4600	Transportation Planning, Operations, and Design	
CS 2110	Computer Organization and Programming	
CS 4641	Machine Learning	

CX 4010	Computational Problem Solving for Scientists and Engineers
CX 4240	Introduction to Computing for Data Analysis
CX 4242	Data and Visual Analytics
ECE 2020	Digital System Design
ECE 2026	Introduction to Signal Processing
ECE 2040	Circuit Analysis
ECE 3035	Mechanisms for Computing Systems
ECE 3076	Computer Communications
ECE 3090	Software Fundamentals for Engineering Systems
ECE 3710	Circuits and Electronics
ECE 3741	Instrumentation and Electronics Lab
ECE 4606	Wireless Communications
ME 2202	Dynamics of Rigid Bodies
ME 3015	System Dynamics and Control
ME 3322	Thermodynamics
ME 3720	Introduction to Fluid and Thermal Engineering
ME 4763	Pulping and Chemical Recovery
ME 4764	Bleaching and Papermaking
MSE 2001	Principles and Applications of Engineering Materials
MSE 3012	Thermal and Transport Properties of Materials
MSE 3015	Electrical, Optical, and Magnetic Properties
NRE 3301	Radiation Physics
Group 2 [9]	
AE 4370	Life Cycle Cost Analysis
AE 4701	Wind Engineering
AE 4793	Composite Materials and Processes
ARCH 6271	Healthcare Design of the Future
BIOS 2400	Math Models in Biology
BIOS 4740	Biologically-Inspired Design
BMED 2300	Problems in Biomedical Engineering II
BMED 3400	Introduction to Biomechanics
BMED 4751	Introduction to Biomaterials
CHBE 4793	Composite Materials and Processes
COE 3002	Intro to Microelectronics and Nanotechnology Revolution
CEE 4225	Introduction to Coastal Engineering
CEE 4330	Air Pollution Engineering
CEE 4793	Composite Materials and Processes
CP 4310	Urban Transportation and Planning
CP 4510	Fundamentals of Geographic Information Systems
ECE 2031	Digital Design Laboratory
ECE 2040	Circuit Analysis
ECE 4755	Electronic Packaging Substrate Fabrication
ME 2110	Creative Decisions and Design
ME 3057	Experimental Methodology and Technical Writing
ME 4740	Biologically Inspired Design
ME 4793	Composite Materials and Processes
MSE 2021	Materials Characterization
MSE 3720	Introduction to Polymer/Fiber Enterprise
MSE 4751	Introduction to Biomaterials
MSE 4755	Electronic Packaging Substrate Fabrication
MSE 4793	Composite Materials and Processing
Operations Research Concentration [10]	
Depth Electives	
ISYE 4803	Special Topics (Linear and Convex Optimization) 3
or ISYE 4133	Advanced Optimization
ISYE 4045	Advanced Simulation 3
ISYE 4232	Advanced Stochastic Systems 3
Breadth Electives (select two of the following):	6
CS 4641	Machine Learning
ECON 3150	Economic and Financial Modeling
ECON 4340	Economics of Industrial Competition
ECON 4350	International Economics
ISYE 3039	Methods of Quality Improvement
ISYE 3103	Introduction to Supply Chain Modeling: Logistics
ISYE 3104	Introduction to Supply Chain Modeling: Manufacturing and Warehousing
ISYE 3106	Cornerstone Design for Industrial Engineers
ISYE 4111	Advanced Supply Chain Logistics
ISYE 4301	Supply Chain Economics
ISYE 4311	Capital Investment Analysis
ISYE 4501	Energy, Efficiency, and Sustainability
ISYE 4803	Special Topics (Advanced Manufacturing)
ISYE 4803	Special Topics (Facility Layout and Warehousing)
ISYE 4803	Special Topics (Business Analytics)
MATH 4262	Mathematical Statistics II
MGT 3078	Finance and Investments
Free Electives [11]	
Free Electives	11
Total Credit Hours	**128**

Pass-fail only allowed for Free Electives, Humanities, and the Social Sciences elective.

Students must achieve a minimum GPA of 2.0 in the BSIE Major Requirements to graduate.

1. Students must earn a C or better in all required MATH courses in the BSIE curriculum.
2. Students may also complete MATH 1554 and MATH 2550 to satisfy math requirements. If MATH 1554/MATH 2550 combination is taken, then two hours from MATH 1554 may be used in Area F to give Area F 18 hours.
3. Only one EAS course can be used toward ISYE Lab Science requirements.
4. PSYC 1101 will satisfy the Ethics requirement.
5. Students must choose from the following to meet the Environmental requirement: BIOS 1107 and BIOS 1107L, BIOS 2300, CEE 2300, CEE 4300,EAS 1600, EAS 1601, EAS 2600, EAS 2750, EAS 3110, EAS 4480,ECON 4440, ISYE 4803 titled “Energy and Environmental Analysis,” ISYE 4501, SLS 3120, or PHYS 2750.

6 Students must complete courses from two different eligible engineering elective subjects.

7 At most, one computing course (CS or CX) is allowed, including courses cross-listed with CS or CX courses.

8 Students must take at least 9 credits of engineering electives. Three credits must be chosen from ECE 2020, ECE 2026, or ECE 3710/ECE 3741. For the remaining 6 credits, at least 2 credits must be from Group 1.

9 To count toward the Engineering Elective Group 2 requirement, all Vertically-Integrated Projects (VIP) courses must be approved by the ISyE Undergraduate Associate Chair. And, at least three, but no more than four, credits of VIP coursework may count toward the Engineering Elective Requirement.

10 Students must complete 5 concentration courses: 3 depth courses and 2 breadth courses. A minimum of 4 of the 5 required concentration courses must be ISYE courses.

11 MATH 1113, MGT 2250, ISYE 3770, and PHYS 2XXX (AP credit) not allowed.

Pass-fail only allowed for Free Electives, Humanities, and the Social Sciences elective.

Students must achieve a minimum GPA of 2.0 in the BSIE Major Requirements to graduate.

1 Students must earn a C or better in all required MATH courses in the BSIE curriculum.

2 Students may also complete MATH 1554 and MATH 2550 to satisfy math requirements. If MATH 1554/MATH 2550 combination is taken, then two hours from MATH 1554 may be used in Area F to give Area F 18 hours.

3 Only one EAS course can be used toward ISYE Lab Science requirements.

4 PSYC 1101 will satisfy the Ethics requirement.

5 Students must choose from the following to meet the Environmental requirement: BIOS 1107 and BIOS 1107L, BIOS 2300, CEE 2300, CEE 4300,EAS 1600, EAS 1601, EAS 2600, EAS 2750, EAS 3110, EAS 4480,ECON 4440, ISYE 4803 titled “Energy and Environmental Analysis,” ISYE 4501, SLS 3120, or PHYS 2750.

6 Students must complete courses from two different eligible engineering elective subjects.

7 At most, one computing course (CS or CX) is allowed, including courses cross-listed with CS or CX courses.

8 Students must take at least 9 credits of engineering electives. Three credits must be chosen from ECE 2020, ECE 2026, or ECE 3710/ECE 3741. For the remaining 6 credits, at least 2 credits must be from Group 1.

9 To count toward the Engineering Elective Group 2 requirement, all Vertically-Integrated Projects (VIP) courses must be approved by the ISyE Undergraduate Associate Chair. And, at least three, but no more than four, credits of VIP coursework may count toward the Engineering Elective Requirement.

10 Students must complete 5 concentration courses: 3 depth courses and 2 breadth courses. A minimum of 4 of the 5 required concentration courses must be ISYE courses. If ISYE 3106 Cornerstone Design is taken as a breadth elective, it must be taken prior to ISYE 4106 Senior Design.

11 MATH 1113, MGT 2250, ISYE 3770, and PHYS 2XXX (AP credit) not allowed.

Bachelor of Science in Industrial Engineering - Supply Chain Engineering

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [1]	4
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus [1]	2
MATH 1553	Introduction to Linear Algebra [1,2]	2
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
ECON 2100	Economic Analysis and Policy Problems	3
PSYC 1101	General Psychology	3
Any SS		3
Core F - Courses Related to Major		
CS 2316	Data Manipulation for Science and Industry	3
CS 4400	Introduction to Database Systems	3
MATH 2551	Multivariable Calculus [1,2]	4
Lab Science [3]		8
Ethics Requirement [4]		
Environmental Requirement [5]		
Major Requirements		
ACCT 2101	Accounting I: Financial Accounting	3
or MGT 300	Financial and Managerial Accounting	
MATH 2603	Introduction to Discrete Mathematics [1]	4
ISYE 2027	Probability with Applications	3
ISYE 3030	Basic Statistical Methods	3
ISYE 3025	Essentials of Engineering Economy	1
ISYE 3133	Engineering Optimization	3
ISYE 3044	Simulation Analysis and Design	3
ISYE 3232	Stochastic Manufacturing and Service Systems	3

ISYE 4031	Regression and Forecasting	3
ISYE 4106	Senior Design	4
Engineering Electives [6]		
Select one of the following:		3
ECE 2020	Digital System Design	
ECE 2026	Introduction to Signal Processing	
ECE 3710 & ECE 3741	Circuits and Electronics and Instrumentation and Electronics Lab	
Select 6 credits of the following: [7,8]		6
Group 1:		
AE 2220	Dynamics	
AE 3450	Thermodynamics and Compressible Flow	
BMED 3100	Systems Physiology	
CHBE 2100	Chemical Process Principles	
CHBE 2110	Chemical Engineering Thermodynamics I	
CHBE 4763	Pulping and Chemical Recovery	
CHBE 4764	Bleaching and Papermaking	
COE 2001	Statics	
COE 3001	Mechanics of Deformable Bodies	
CEE 2040	Dynamics	
CEE 2300	Environmental Engineering Principles	
CEE 3010	Geomatics	
CEE 4100	Construction Engineering and Management	
CEE 4300	Environmental Engineering Systems	
CEE 4600	Transportation Planning, Operations, and Design	
CS 2110	Computer Organization and Programming	
CS 4641	Machine Learning	
CX 4010	Computational Problem Solving for Scientists and Engineers	
CX 4240	Introduction to Computing for Data Analysis	
CX 4242	Data and Visual Analytics	
ECE 2020	Digital System Design	
ECE 2026	Introduction to Signal Processing	
ECE 2040	Circuit Analysis	
ECE 3035	Mechanisms for Computing Systems	
ECE 3076	Computer Communications	
ECE 3090	Software Fundamentals for Engineering Systems	
ECE 3710	Circuits and Electronics	
ECE 3741	Instrumentation and Electronics Lab	
ECE 4606	Wireless Communications	
ME 2202	Dynamics of Rigid Bodies	
ME 3015	System Dynamics and Control	
ME 3322	Thermodynamics	
ME 3720	Introduction to Fluid and Thermal Engineering	
ME 4763	Pulping and Chemical Recovery	
ME 4764	Bleaching and Papermaking	
MSE 2001	Principles and Applications of Engineering Materials	
MSE 3012	Thermal and Transport Properties of Materials	
MSE 3015	Electrical, Optical, and Magnetic Properties	
NRE 3301	Radiation Physics	
Group 2: [9]		
AE 4370	Life Cycle Cost Analysis	
AE 4701	Wind Engineering	
AE 4793	Composite Materials and Processes	
ARCH 6271	Healthcare Design of the Future	
BIOS 2400	Math Models in Biology	
BIOS 4740	Biologically-Inspired Design	
BMED 2300	Problems in Biomedical Engineering II	
BMED 3400	Introduction to Biomechanics	
BMED 4751	Introduction to Biomaterials	
CHBE 4793	Composite Materials and Processes	
COE 3002	Intro to Microelectronics and Nanotechnology Revolution	
CEE 4225	Introduction to Coastal Engineering	
CEE 4330	Air Pollution Engineering	
CEE 4793	Composite Materials and Processes	
CP 4310	Urban Transportation and Planning	
CP 4510	Fundamentals of Geographic Information Systems	
ECE 2031	Digital Design Laboratory	
ECE 4755	Electronic Packaging Substrate Fabrication	
ISYE 4740	Bio-Inspired Design	
MATH 4755	Mathematical Biology	
ME 2110	Creative Decisions and Design	
ME 3057	Experimental Methodology and Technical Writing	
ME 4740	Biologically Inspired Design	
ME 4793	Composite Materials and Processes	
MSE 2021	Materials Characterization	
MSE 3720	Introduction to Polymer/Fiber Enterprise	
MSE 4751	Introduction to Biomaterials	
MSE 4755	Electronic Packaging Substrate Fabrication	
MSE 4793	Composite Materials and Processing	
Supply Chain Engineering Concentration [10]		
Depth Electives		
ISYE 3103	Introduction to Supply Chain Modeling: Logistics	3
ISYE 3104	Introduction to Supply Chain Modeling: Manufacturing and Warehousing	3
ISYE 4803	Special Topics (Advanced Manufacturing or Facility Layout and Warehousing)	3
or ISYE 411	Advanced Supply Chain Logistics	
Breadth Electives (select two of the following):		6
CS 4641	Machine Learning	
CX 4010	Computational Problem Solving for Scientists and Engineers	
CX 4240	Introduction to Computing for Data Analysis	
CX 4242	Data and Visual Analytics	
ECON 3150	Economic and Financial Modeling	
ECON 4340	Economics of Industrial Competition	
ECON 4350	International Economics	
ISYE 3039	Methods of Quality Improvement	
ISYE 3106	Cornerstone Design for Industrial Engineers	

	ISYE 4034	Decision and Data Analytics
	ISYE 4045	Advanced Simulation
	ISYE 4133	Advanced Optimization
	ISYE 4134	Constraint Programming
	ISYE 4232	Advanced Stochastic Systems
	ISYE 4301	Supply Chain Economics
	ISYE 4311	Capital Investment Analysis
	ISYE 4501	Energy, Efficiency, and Sustainability
	ISYE 4803	Special Topics (Linear and Convex Optimization)
	MATH 4262	Mathematical Statistics II
	MGT 3078	Finance and Investments
Free Electives [11]		
Free Electives		11
Total Credit Hours		**128**

Pass-fail only allowed for Free Electives, Humanities, and the Social Sciences elective.

Students must achieve a minimum GPA of 2.0 in the BSIE Major Requirements to graduate.

1. Students must earn a C or better in all required MATH courses in the BSIE curriculum.
2. Students may also complete MATH 1554 and MATH 2550 to satisfy math requirements. If MATH 1554/MATH 2550 combination is taken, then two hours from MATH 1554 may be used in Area F to give Area F 18 hours.
3. Only one EAS course can be used toward ISYE Lab Science requirements.
4. PSYC 1101 will satisfy the Ethics requirement.
5. Students must choose from the following to meet the Environmental requirement: BIOS 1107 and BIOS 1107L, BIOS 2300, CEE 2300, CEE 4300, EAS 1600, EAS 1601, EAS 2600, EAS 2750, EAS 3110, EAS 4480, ECON 4440, ISYE 4803 titled “Energy and Environmental Analysis,” ISYE 4501, SLS 3120, or PHYS 2750.
6. Students must complete courses from two different eligible engineering elective subjects.
7. At most, one computing course (CS or CX) is allowed, including courses cross-listed with CS or CX courses.
8. Students must take at least 9 credits of engineering electives. Three credits must be chosen from ECE 2020, ECE 2026, orECE 3710/ECE 3741. For the remaining 6 credits, at least 2 credits must be from Group 1.
9. To count toward the Engineering Elective Group 2 requirement, all Vertically-Integrated Projects (VIP) courses must be approved by the ISyE Undergraduate Associate Chair, and at least three but no more than four credits of VIP coursework may count toward the Engineering Elective requirement.
10. Students must complete 5 concentration courses: 3 depth courses and 2 breadth courses. A minimum of 4 of the 5 required concentration courses must be ISYE courses. If ISYE 3106 Cornerstone Design is taken as a breadth elective, it must be taken prior to ISYE 4106 Senior Design.
11. MATH 1113, MGT 2250, ISYE 3770, and PHYS 2XXX (AP credit) not allowed.

BACHELOR OF SCIENCE IN INTERNATIONAL AFFAIRS AND MODERN LANGUAGE

In partnership with the Sam Nunn School of International Affairs, the School of Modern Languages offers a joint Bachelor of Science in International Affairs and Modern Language (IAML) with separate concentrations in Chinese, French, German, Japanese, Korean, Russian, and Spanish. Students in this program take the same required core courses as for the Bachelor of Science in International Affairs, but also receive intensive foreign language training and learn the fundamentals of dealing with foreign cultures and societies. IAML students learn how to formulate the policy decisions that must be made in an increasingly multilingual and multicultural global forum. Our graduates are prepared for advanced graduate and professional study and are ready for employment in a large arena of globally oriented businesses, government agencies, as well as social service and not-for-profit organizations.

- Bachelor of Science in International Affairs and Modern Language - Chinese
- Bachelor of Science in International Affairs and Modern Language - French
- Bachelor of Science in International Affairs and Modern Language - German
- Bachelor of Science in International Affairs and Modern Language - Japanese
- Bachelor of Science in International Affairs and Modern Language - Korean
- Bachelor of Science in International Affairs and Modern Language - Russian
- Bachelor of Science in International Affairs and Modern Language - Spanish

Bachelor of Science in International Affairs and Modern Language - Chinese

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1315	Introduction to Media Computation	3
Core C - Humanities		
Modern Languages [1,2]		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Select one of the following:		3
HTS 1031	Europe Since the Renaissance	
HTS 2036	Revolutionary Europe: 1789-1914	
HTS 2037	Twentieth Century Europe: 1914 to Present	
HTS 2040	History of Islamic Societies	
HTS 2041	History of the Modern Middle East	
HTS 2061	Traditional Asia and Its Legacy	
HTS 2062	Asia in the Modern World	
HTS 3028	Ancient Greece: Gods, Heroes, and RuinS	
HTS 3029	Ancient Rome: From Greatness to Ruins	
HTS 3030	Medieval Europe: 350 to 1400	
HTS 3031	European Labor History	
HTS 3032	Modern European Intellectual History	
HTS 3033	Medieval England	
HTS 3035	Britain from 1815-1914	
HTS 3036	Britain Since 1914	
HTS 3038	The French Revolution	
HTS 3039	Modern France	
HTS 3041	Modern Spain	
HTS 3043	Modern Germany	
HTS 3045	Nazi Germany and the Holocaust	
HTS 3046	Science, Polilitcs, and Culture in Nazi Germany	
HTS 3051	Women and the Politics of Gender in the Middle East	
HTS 3061	Modern China	
HTS 3062	Modern Japan	
HTS 3063	Outposts of Empire: Comparative History of British	
HTS 3065	History of Global Societies	
HTS 3067	Revolutionary Movements in the Modern World	
HTS 3069	Modern Cuba	
INTA 1110	Introduction to International Relations [2]	3

Core F - Courses Related to Major		
INTA 2010	Empirical Methods [2]	3
INTA 2040	Science, Technology, and International Affairs [2]	3
INTA 1000- or 2000-level Electives [2]		9
Select one of the following: [4, 5]		3
BMED 2400	Introduction to Bioengineering Statistics	
CP 4510	Fundamentals of Geographic Information Systems	
CS 1301	Introduction to Computing	
CS 1315	Introduction to Media Computation	
CS 1316	Representing Structure and Behavior	
CS 1331	Introduction to Object Oriented Programming	
CS 2316	Data Manipulation for Science and Industry	
EAS 3110	Energy, Environment, and Society	
EAS 4480	Environmental Data Analysis	
ECE 2020	Digital System Design	
ID 3103	Industrial Design Computing I	
LMC 3402	Graphic and Visual Design	
LMC 3410	The Rhetoric of Nonlinear Documents	
ME 2016	Computer Applications	
MGT 2210	Information Systems and Digital Transformation	
MGT 4051	Decision Support and Expert Systems	
MGT 4052	Systems Analysis and Design	
Major Requirements		
INTA 2001	Careers in International Affairs	1
INTA 3110	U.S. Foreign Policy [2]	3
INTA 3203	Comparative Politics [2]	3
INTA 3301	International Political Economy [2]	3
INTA 4500	Pro-Seminar in International Affairs [2]	3
INTA 3000- or 4000-level Electives [2]		12
Capstone Requirement		
CHIN 4500	Advanced Intercultural Seminar [2]	3
Modern Language		
Modern Languages [1,2]		15
Free Electives		
Free Electives [3]		16
Total Credit Hours		**122**

Note: Non-credit requirement

With the goal of enhanced educational and career prospects and in accordance with the pedagogical objectives of the degree in International Affairs and Modern Language, all IAML students are required to fulfill an International Experience as part of their graduation requirements. This requirement can be met through one of two ways:

1. Complete a minimum 6-week overseas experience. If this is not a country whose primary language is in the student's language of study, the student must justify and receive prior approval.

2. Complete a 15-week internship or similar experience of at least 10 credit hours per week at an international organization such as consulate, CNN International, etc. The internship must be approved in advance.

Students must complete 39 hours of upper division (3000/4000-level courses). Fifteen hours of the free electives, language, or technology requirements must be upper division (3000/4000-level coursework).

For all language courses, the language of instruction must be the same as the language of learning. English-taught culture courses will not apply to language requirements.

1. Students must complete 21 credit hours of CHIN electives from 2002, 3000- or 4000-level courses. Six credit hours are counted in Humanities, and 15 in Modern Languages Electives.
2. Minimum grade of C required.
3. CHIN courses below 2002 may count toward the free elective courses.
4. Technical elective.
5. Approved instances of CS 2803 may be applied here by advisor.

Bachelor of Science in International Affairs and Modern Language - French

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1315	Introduction to Media Computation	3
Core C - Humanities		
Modern Languages [2]		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	

Select one of the following:		3
HTS 1031	Europe Since the Renaissance	
HTS 2036	Revolutionary Europe: 1789-1914	
HTS 2037	Twentieth Century Europe: 1914 to Present	
HTS 2040	History of Islamic Societies	
HTS 2041	History of the Modern Middle East	
HTS 2061	Traditional Asia and Its Legacy	
HTS 2062	Asia in the Modern World	
HTS 3028	Ancient Greece: Gods, Heroes, and RuinS	
HTS 3029	Ancient Rome: From Greatness to Ruins	
HTS 3030	Medieval Europe: 350 to 1400	
HTS 3031	European Labor History	
HTS 3032	Modern European Intellectual History	
HTS 3033	Medieval England	
HTS 3035	Britain from 1815-1914	
HTS 3036	Britain Since 1914	
HTS 3038	The French Revolution	
HTS 3039	Modern France	
HTS 3041	Modern Spain	
HTS 3043	Modern Germany	
HTS 3045	Nazi Germany and the Holocaust	
HTS 3046	Science, Polilltics, and Culture in Nazi Germany	
HTS 3051	Women and the Politics of Gender in the Middle East	
HTS 3061	Modern China	
HTS 3062	Modern Japan	
HTS 3063	Outposts of Empire: Comparative History of British	
HTS 3065	History of Global Societies	
HTS 3067	Revolutionary Movements in the Modern World	
HTS 3069	Modern Cuba	
INTA 1110	Introduction to International Relations [2]	3
Core F - Courses Related to Major		
INTA 2010	Empirical Methods [2]	3
INTA 2040	Science, Technology, and International Affairs [2]	3
INTA 1000- or 2000-level Electives [2]		9
Select one of the following: [4,5]		3
BMED 2400	Introduction to Bioengineering Statistics	
CP 4510	Fundamentals of Geographic Information Systems	
CS 1301	Introduction to Computing	
CS 1315	Introduction to Media Computation	
CS 1316	Representing Structure and Behavior	
CS 1331	Introduction to Object Oriented Programming	
CS 2316	Data Manipulation for Science and Industry	
EAS 3110	Energy, Environment, and Society	
EAS 4480	Environmental Data Analysis	
ECE 2020	Digital System Design	
ID 3103	Industrial Design Computing I	
LMC 3402	Graphic and Visual Design	
LMC 3410	The Rhetoric of Nonlinear Documents	
ME 2016	Computer Applications	
MGT 2210	Information Systems and Digital Transformation	
MGT 4051	Decision Support and Expert Systems	
MGT 4052	Systems Analysis and Design	
Major Requirements		
INTA 2001	Careers in International Affairs	1
INTA 3110	U.S. Foreign Policy [2]	3
INTA 3203	Comparative Politics [2]	3
INTA 3301	International Political Economy [2]	3
INTA 4500	Pro-Seminar in International Affairs [2]	3
INTA 3000- or 4000-level Electives [2]		12
Modern Language		
FREN 4500	Advanced Intercultural Seminar [2]	3
Modern Languages [1,2]		15
Free Electives		
Free Electives [3]		16
Total Credit Hours		**122**

Note: Non-credit requirement

With the goal of enhanced educational and career prospects and in accordance with the pedagogical objectives of the degree in International Affairs and Modern Language, all IAML students are required to fulfill an International Experience as part of their graduation requirements. This requirement can be met through one of two ways:

1. Complete a minimum 6-week overseas experience. If this is not a country whose primary language is in the student's language of study, the student must justify and receive prior approval.

2. Complete a 15-week internship or similar experience of at least 10 credit hours per week at an international organization such as consulate, CNN International, etc. The internship must be approved in advance.

Students must complete 39 hours of upper division (3000/4000-level courses). Fifteen hours of the free electives, language, or technology requirements must be upper division (3000/4000-level coursework).

For all language courses, the language of instruction must be the same as the language of learning. English-taught culture courses will not apply to language requirements.

1. Students must complete 21 credit hours of FREN electives from 3000- or 4000-level courses. Six credit hours are counted in Humanities, and 15 in Modern Languages Electives.
2. Minimum grade of C required.
3. FREN courses below 3000 may count toward the free elective courses.
4. Technical elective.
5. Approved instances of CS 2803 may be applied here by advisor.

Bachelor of Science in International Affairs and Modern Language - German

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2

or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1315	Introduction to Media Computation	3
Core C - Humanities		
Modern Languages [2]		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Select one of the following:		3
HTS 1031	Europe Since the Renaissance	
HTS 2036	Revolutionary Europe: 1789-1914	
HTS 2037	Twentieth Century Europe: 1914 to Present	
HTS 2040	History of Islamic Societies	
HTS 2041	History of the Modern Middle East	
HTS 2061	Traditional Asia and Its Legacy	
HTS 2062	Asia in the Modern World	
HTS 3028	Ancient Greece: Gods, Heroes, and RuinS	
HTS 3029	Ancient Rome: From Greatness to Ruins	
HTS 3030	Medieval Europe: 350 to 1400	
HTS 3031	European Labor History	
HTS 3032	Modern European Intellectual History	
HTS 3033	Medieval England	
HTS 3035	Britain from 1815-1914	
HTS 3036	Britain Since 1914	
HTS 3038	The French Revolution	
HTS 3039	Modern France	
HTS 3041	Modern Spain	
HTS 3043	Modern Germany	
HTS 3045	Nazi Germany and the Holocaust	
HTS 3046	Science, Polilitics, and Culture in Nazi Germany	
HTS 3051	Women and the Politics of Gender in the Middle East	
HTS 3061	Modern China	
HTS 3062	Modern Japan	
HTS 3063	Outposts of Empire: Comparative History of British	
HTS 3065	History of Global Societies	
HTS 3067	Revolutionary Movements in the Modern World	
HTS 3069	Modern Cuba	
INTA 1110	Introduction to International Relations [2]	3
Core F - Courses Related to Major		
INTA 2010	Empirical Methods [2]	3
INTA 2040	Science, Technology, and International Affairs [2]	3
INTA 1000- or 2000-level Electives [2]		9
Select one of the following: [4,5]		3
BMED 2400	Introduction to Bioengineering Statistics	
CP 4510	Fundamentals of Geographic Information Systems	
CS 1301	Introduction to Computing	
CS 1315	Introduction to Media Computation	
CS 1316	Representing Structure and Behavior	
CS 1331	Introduction to Object Oriented Programming	
CS 2316	Data Manipulation for Science and Industry	
ID 3103	Industrial Design Computing I	
EAS 3110	Energy, Environment, and Society	
EAS 4480	Environmental Data Analysis	
ECE 2020	Digital System Design	
LMC 3402	Graphic and Visual Design	
LMC 3410	The Rhetoric of Nonlinear Documents	
ME 2016	Computer Applications	
MGT 2210	Information Systems and Digital Transformation	
MGT 4051	Decision Support and Expert Systems	
MGT 4052	Systems Analysis and Design	
Major Requirements		
INTA 2001	Careers in International Affairs	1
INTA 3110	U.S. Foreign Policy [2]	3
INTA 3203	Comparative Politics [2]	3
INTA 3301	International Political Economy [2]	3
INTA 4500	Pro-Seminar in International Affairs [2]	3
INTA 3000- or 4000-level Electives [2]		12
Modern Language		
GRMN 4500	Advanced Intercultural Seminar [2]	3
Modern Languages [1,2]		15
Free Electives		
Free Electives [3]		16
Total Credit Hours		**122**

Note: Non-credit requirement

With the goal of enhanced educational and career prospects and in accordance with the pedagogical objectives of the degree in International Affairs and Modern Language, all IAML students are required to fulfill an

International Experience as part of their graduation requirements. This requirement can be met through one of two ways:

1. Complete a minimum 6-week overseas experience. If this is not a country whose primary language is in the student's language of study, the student must justify and receive prior approval.

2. Complete a 15-week internship or similar experience of at least 10 credit hours per week at an international organization such as consulate, CNN International, etc. The internship must be approved in advance.

Students must complete 39 hours of upper division coursework (3000/4000-level courses). Fifteen hours of free electives, language, or technology requirements must be upper division (3000/4000-level courses).

For all language courses, the language of instruction must be the same as the language of learning. English-taught culture courses will not apply to language requirements.

1. Students must complete 21 credit hours of GRMN electives from 3000- or 4000-level courses. Six credit hours are counted in Humanities, and 15 in Modern Languages Electives.
2. Minimum grade of C required.
3. GRMN courses below 3000-level may count toward the free elective courses.
4. Technical elective.
5. Approved instances of CS 2803 may be applied here by advisor.

Bachelor of Science in International Affairs and Modern Language - Japanese

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1315	Introduction to Media Computation	3
Core C - Humanities		
Modern Languages [1,2]		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Select one of the following:		3
HTS 1031	Europe Since the Renaissance	
HTS 2036	Revolutionary Europe: 1789-1914	
HTS 2037	Twentieth Century Europe: 1914 to Present	
HTS 2040	History of Islamic Societies	
HTS 2041	History of the Modern Middle East	
HTS 2061	Traditional Asia and Its Legacy	
HTS 2062	Asia in the Modern World	
HTS 3028	Ancient Greece: Gods, Heroes, and RuinS	
HTS 3029	Ancient Rome: From Greatness to Ruins	
HTS 3030	Medieval Europe: 350 to 1400	
HTS 3031	European Labor History	
HTS 3032	Modern European Intellectual History	
HTS 3033	Medieval England	
HTS 3035	Britain from 1815-1914	
HTS 3036	Britain Since 1914	
HTS 3038	The French Revolution	
HTS 3039	Modern France	
HTS 3041	Modern Spain	
HTS 3043	Modern Germany	
HTS 3045	Nazi Germany and the Holocaust	
HTS 3046	Science, Polilitics, and Culture in Nazi Germany	
HTS 3051	Women and the Politics of Gender in the Middle East	
HTS 3061	Modern China	
HTS 3062	Modern Japan	
HTS 3063	Outposts of Empire: Comparative History of British	
HTS 3065	History of Global Societies	
HTS 3067	Revolutionary Movements in the Modern World	
HTS 3069	Modern Cuba	
INTA 1110	Introduction to International Relations [2]	3
Core F - Courses Related to Major		
INTA 2010	Empirical Methods [2]	3
INTA 2040	Science, Technology, and International Affairs [2]	3
INTA 1000- or 2000-level Electives [2]		9
Select one of the following: [4, 5]		3
BMED 2400	Introduction to Bioengineering Statistics	
CP 4510	Fundamentals of Geographic Information Systems	
CS 1301	Introduction to Computing	
CS 1315	Introduction to Media Computation	
CS 1316	Representing Structure and Behavior	

CS 1331	Introduction to Object Oriented Programming	
CS 2316	Data Manipulation for Science and Industry	
EAS 3110	Energy, Environment, and Society	
EAS 4480	Environmental Data Analysis	
ECE 2020	Digital System Design	
ID 3103	Industrial Design Computing I	
LMC 3402	Graphic and Visual Design	
LMC 3410	The Rhetoric of Nonlinear Documents	
ME 2016	Computer Applications	
MGT 2210	Information Systems and Digital Transformation	
MGT 4051	Decision Support and Expert Systems	
MGT 4052	Systems Analysis and Design	
Major Requirements		
INTA 2001	Careers in International Affairs	1
INTA 3110	U.S. Foreign Policy [2]	3
INTA 3203	Comparative Politics [2]	3
INTA 3301	International Political Economy [2]	3
INTA 4500	Pro-Seminar in International Affairs [2]	3
INTA 3000- or 4000-level Electives [2]		12
Capstone Requirement		
JAPN 4500	Advanced Intercultural Seminar	3
Modern Language		
Modern Languages [1,2]		15
Free Electives		
Free Electives [3]		16
Total Credit Hours		**122**

Note: Non-credit requirement

With the goal of enhanced educational and career prospects and in accordance with the pedagogical objectives of the degree in International Affairs and Modern Language, all IAML students are required to fulfill an International Experience as part of their graduation requirements. This requirement can be met through one of two ways:

1. Complete a minimum 6-week overseas experience. If this is not a country whose primary language is in the student's language of study, the student must justify and receive prior approval.

2. Complete a 15-week internship or similar experience of at least 10 credit hours per week at an international organization such as consulate, CNN International, etc. The internship must be approved in advance.

Students must complete 39 hours of upper division (3000/4000-level courses). Fifteen hours of the free electives, language, or technology requirements must be upper division (3000/4000-level coursework).

For all language courses, the language of instruction must be the same as the language of learning. English-taught culture courses will not apply to language requirements.

1. Students must complete 21 credit hours of JAPN electives from 2002, 3000- or 4000-level courses. Six credit hours are counted in Humanities, and 15 in Modern Languages Electives.
2. Minimum grade of C required.
3. JAPN courses below 2002 may count toward the free elective courses.
4. Technical elective.
5. Approved instances of CS 2803 may be applied here by advisor.

Bachelor of Science in International Affairs and Modern Language - Korean

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1315	Introduction to Media Computation	3
Core C - Humanities		
Modern Languages [1,2]		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Select one of the following:		3
HTS 1031	Europe Since the Renaissance	
HTS 2036	Revolutionary Europe: 1789-1914	
HTS 2037	Twentieth Century Europe: 1914 to Present	
HTS 2040	History of Islamic Societies	
HTS 2041	History of the Modern Middle East	
HTS 2061	Traditional Asia and Its Legacy	
HTS 2062	Asia in the Modern World	
HTS 3028	Ancient Greece: Gods, Heroes, and RuinS	
HTS 3029	Ancient Rome: From Greatness to Ruins	
HTS 3030	Medieval Europe: 350 to 1400	
HTS 3031	European Labor History	

HTS 3032	Modern European Intellectual History	
HTS 3033	Medieval England	
HTS 3035	Britain from 1815-1914	
HTS 3036	Britain Since 1914	
HTS 3038	The French Revolution	
HTS 3039	Modern France	
HTS 3041	Modern Spain	
HTS 3043	Modern Germany	
HTS 3045	Nazi Germany and the Holocaust	
HTS 3046	Science, Polilics, and Culture in Nazi Germany	
HTS 3051	Women and the Politics of Gender in the Middle East	
HTS 3061	Modern China	
HTS 3062	Modern Japan	
HTS 3063	Outposts of Empire: Comparative History of British	
HTS 3065	History of Global Societies	
HTS 3067	Revolutionary Movements in the Modern World	
HTS 3069	Modern Cuba	
INTA 1110	Introduction to International Relations [2]	3
Core F - Courses Related to Major		
INTA 2010	Empirical Methods [2]	3
INTA 2040	Science, Technology, and International Affairs [2]	3
INTA 1000- or 2000-level Electives [2]		9
Select one of the following: [4, 5]		3
BMED 2400	Introduction to Bioengineering Statistics	
CP 4510	Fundamentals of Geographic Information Systems	
CS 1301	Introduction to Computing	
CS 1315	Introduction to Media Computation	
CS 1316	Representing Structure and Behavior	
CS 1331	Introduction to Object Oriented Programming	
CS 2316	Data Manipulation for Science and Industry	
EAS 3110	Energy, Environment, and Society	
EAS 4480	Environmental Data Analysis	
ECE 2020	Digital System Design	
ID 3103	Industrial Design Computing I	
LMC 3402	Graphic and Visual Design	
LMC 3410	The Rhetoric of Nonlinear Documents	
ME 2016	Computer Applications	
MGT 2210	Information Systems and Digital Transformation	
MGT 4051	Decision Support and Expert Systems	
MGT 4052	Systems Analysis and Design	
Major Requirements		
INTA 2001	Careers in International Affairs	1
INTA 3110	U.S. Foreign Policy [2]	3
INTA 3203	Comparative Politics [2]	3
INTA 3301	International Political Economy [2]	3
INTA 4500	Pro-Seminar in International Affairs [2]	3
INTA 3000- or 4000-level Electives [2]		12
Capstone Requirement		
KOR 4500	Intercultural Seminar	3
Modern Language		
Modern Languages [1,2]		15
Free Electives		
Free Electives [3]		16
Total Credit Hours		**122**

Note: Non-credit requirement

With the goal of enhanced educational and career prospects and in accordance with the pedagogical objectives of the degree in International Affairs and Modern Language, all IAML students are required to fulfill an International Experience as part of their graduation requirements. This requirement can be met through one of two ways:

1. Complete a minimum 6-week overseas experience. If this is not a country whose primary language is in the student's language of study, the student must justify and receive prior approval.

2. Complete a 15-week internship or similar experience of at least 10 credit hours per week at an international organization such as consulate, CNN International, etc. The internship must be approved in advance.

Students must complete 39 hours of upper division (3000/4000-level courses). Fifteen hours of the free electives, language, or technology requirements must be upper division (3000/4000-level coursework).

For all language courses, the language of instruction must be the same as the language of learning. English-taught culture courses will not apply to language requirements.

1. Students must complete 21 credit hours of KOR electives from 2002, 3000- or 4000-level courses. Six credit hours are counted in Humanities, and 15 in Modern Languages Electives.
2. Minimum grade of C required.
3. KOR courses below 2002 may count toward the free elective courses.
4. Technical elective.
5. Approved instances of CS 2803 may be applied here by advisor.

Bachelor of Science in International Affairs and Modern Language - Russian

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1315	Introduction to Media Computation	3
Core C - Humanities		
Modern Languages [2,3]		6
Core D - Science, Math, & Technology		

Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics	4
or MATH 15 & MATH 15	Differential Calculus and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Select one of the following:		3
HTS 1031	Europe Since the Renaissance	
HTS 2036	Revolutionary Europe: 1789-1914	
HTS 2037	Twentieth Century Europe: 1914 to Present	
HTS 2040	History of Islamic Societies	
HTS 2041	History of the Modern Middle East	
HTS 2061	Traditional Asia and Its Legacy	
HTS 2062	Asia in the Modern World	
HTS 3028	Ancient Greece: Gods, Heroes, and RuinS	
HTS 3029	Ancient Rome: From Greatness to Ruins	
HTS 3030	Medieval Europe: 350 to 1400	
HTS 3031	European Labor History	
HTS 3032	Modern European Intellectual History	
HTS 3033	Medieval England	
HTS 3035	Britain from 1815-1914	
HTS 3036	Britain Since 1914	
HTS 3038	The French Revolution	
HTS 3039	Modern France	
HTS 3041	Modern Spain	
HTS 3043	Modern Germany	
HTS 3045	Nazi Germany and the Holocaust	
HTS 3046	Science, Polilics, and Culture in Nazi Germany	
HTS 3051	Women and the Politics of Gender in the Middle East	
HTS 3061	Modern China	
HTS 3062	Modern Japan	
HTS 3063	Outposts of Empire: Comparative History of British	
HTS 3065	History of Global Societies	
HTS 3067	Revolutionary Movements in the Modern World	
HTS 3069	Modern Cuba	
INTA 1110	Introduction to International Relations [2]	3
Core F - Courses Related to Major		
INTA 2010	Empirical Methods [2]	3
INTA 2040	Science, Technology, and International Affairs [2]	3
INTA 1000- or 2000-level Electives [2]		9
Select one of the following: [4,5]		3
BMED 2400	Introduction to Bioengineering Statistics	
CP 4510	Fundamentals of Geographic Information Systems	
CS 1301	Introduction to Computing	
CS 1315	Introduction to Media Computation	
CS 1316	Representing Structure and Behavior	
CS 1331	Introduction to Object Oriented Programming	
CS 2316	Data Manipulation for Science and Industry	
EAS 3110	Energy, Environment, and Society	
EAS 4480	Environmental Data Analysis	
ECE 2020	Digital System Design	
ID 3103	Industrial Design Computing I	
LMC 3402	Graphic and Visual Design	
LMC 3410	The Rhetoric of Nonlinear Documents	
ME 2016	Computer Applications	
MGT 2210	Information Systems and Digital Transformation	
MGT 4051	Decision Support and Expert Systems	
MGT 4052	Systems Analysis and Design	
Major Requirements		
INTA 2001	Careers in International Affairs	1
INTA 3110	U.S. Foreign Policy [2]	3
INTA 3203	Comparative Politics [2]	3
INTA 3301	International Political Economy [2]	3
INTA 4500	Pro-Seminar in International Affairs [2]	3
INTA 3000- or 4000-level Electives [2]		12
Modern Language		
RUSS 4500	Russian Intercultural Capstone Seminar [2]	3
Modern Languages [1,2]		15
Free Electives		
Free Electives [3]		16
Total Credit Hours		**122**

Note: Non-credit requirement

With the goal of enhanced educational and career prospects and in accordance with the pedagogical objectives of the degree in International Affairs and Modern Languages, all IAML students are required to fulfill an International Experience as part of their graduation requirements. This requirement can be met through one of two ways:

1. Complete a minimum 6-week overseas experience. If this is not a country whose primary language is in the student's language of study, the student must justify and receive prior approval.

2. Complete a 15-week internship or similar experience of at least 10 credit hours per week at an international organization such as consulate, CNN International, etc. The internship must be approved in advance.

Students must complete 39 hours of upper division coursework (3000/4000-level courses). Fifteen hours of free electives, language, or technology requirements must be upper division (3000/4000-level courses).

For all language courses, the language of instruction must be the same as the language of learning. English-taught culture courses will not apply to language requirements.

1 Students must complete 21 credit hours of RUSS electives from 2002, 3000- or 4000-level courses. Six credit hours are counted in Humanities, and 15 in Modern Languages Electives.
2 Minimum grade of C required.
3 RUSS courses below 2002 may count toward the free elective courses.
4 Technical elective.
5 Approved instances of CS 2803 may be applied here by advisor.

Bachelor of Science in International Affairs and Modern Language - Spanish

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1315	Introduction to Media Computation	3
Core C - Humanities		
Modern Languages [2]		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Select one of the following:		3
HTS 1031	Europe Since the Renaissance	
HTS 2036	Revolutionary Europe: 1789-1914	
HTS 2037	Twentieth Century Europe: 1914 to Present	
HTS 2040	History of Islamic Societies	
HTS 2041	History of the Modern Middle East	
HTS 2061	Traditional Asia and Its Legacy	
HTS 2062	Asia in the Modern World	
HTS 3028	Ancient Greece: Gods, Heroes, and RuinS	
HTS 3029	Ancient Rome: From Greatness to Ruins	
HTS 3030	Medieval Europe: 350 to 1400	
HTS 3031	European Labor History	
HTS 3032	Modern European Intellectual History	
HTS 3033	Medieval England	
HTS 3035	Britain from 1815-1914	
HTS 3036	Britain Since 1914	
HTS 3038	The French Revolution	
HTS 3039	Modern France	
HTS 3041	Modern Spain	
HTS 3043	Modern Germany	
HTS 3045	Nazi Germany and the Holocaust	
HTS 3046	Science, Polilitics, and Culture in Nazi Germany	
HTS 3051	Women and the Politics of Gender in the Middle East	
HTS 3061	Modern China	
HTS 3062	Modern Japan	
HTS 3063	Outposts of Empire: Comparative History of British	
HTS 3065	History of Global Societies	
HTS 3067	Revolutionary Movements in the Modern World	
HTS 3069	Modern Cuba	
INTA 1110	Introduction to International Relations [2]	3
Core F - Courses Related to Major		
INTA 2010	Empirical Methods [2]	3
INTA 2040	Science, Technology, and International Affairs [2]	3
INTA 1000- or 2000-level Electives [2]		9
Select one of the following: [4,5]		3
BMED 2400	Introduction to Bioengineering Statistics	
CP 4510	Fundamentals of Geographic Information Systems	
CS 1301	Introduction to Computing	
CS 1315	Introduction to Media Computation	
CS 1316	Representing Structure and Behavior	
CS 1331	Introduction to Object Oriented Programming	
CS 2316	Data Manipulation for Science and Industry	
EAS 3110	Energy, Environment, and Society	
EAS 4480	Environmental Data Analysis	
ECE 2020	Digital System Design	
ID 3103	Industrial Design Computing I	
LMC 3402	Graphic and Visual Design	
LMC 3410	The Rhetoric of Nonlinear Documents	
ME 2016	Computer Applications	
MGT 2210	Information Systems and Digital Transformation	
MGT 4051	Decision Support and Expert Systems	
MGT 4052	Systems Analysis and Design	

Major Requirements		
INTA 2001	Careers in International Affairs	1
INTA 3110	U.S. Foreign Policy [2]	3
INTA 3203	Comparative Politics [2]	3
INTA 3301	International Political Economy [2]	3
INTA 4500	Pro-Seminar in International Affairs [2]	3
INTA 3000- or 4000-level Electives [2]		12
Capstone Requirement		
SPAN 4500	Advanced Intercultural Seminar [2]	3
Modern Language		
Modern Languages [1,2]		15
Free Electives		
Free Electives [3]		16
Total Credit Hours		**122**

Note: Non-credit requirement

With the goal of enhanced educational and career prospects and in accordance with the pedagogical objectives of the degree in International Affairs and Modern Languages, all IAML students are required to fulfill an International Experience as part of their graduation requirements. This requirement can be met through one of two ways:

1. Complete a minimum 6-week overseas experience. If this is not a country whose primary language is in the student's language of study, the student must justify and receive prior approval.

2. Complete a 15-week internship or similar experience of at least 10 credit hours per week at an international organization such as consulate, CNN International, etc. The internship must be approved in advance.

Students must complete 39 hours of upper division coursework (3000/4000-level courses). Fifteen hours of free electives, language, or technology requirements must be upper division (3000/4000-level courses).

For all language courses, the language of instruction must be the same as the language of learning. English-taught culture courses will not apply to language requirements.

1. Students must complete 21 credit hours of SPAN electives from 3000- or 4000-level courses. Six credit hours are counted in Humanities, and 15 in Modern Languages Electives.
2. Minimum grade of C required.
3. SPAN courses below 3000-level may count toward the free elective courses.
4. Technical elective.
5. Approved instances of CS 2803 may be applied here by advisor.

BACHELOR OF SCIENCE IN INTERNATIONAL AFFAIRS

The Bachelor of Science in International Affairs (BS INTA) program includes instruction in international affairs, foreign languages, ethics and philosophy, social and natural sciences, and computer science. Upper-division coursework provides training in four substantive areas:

- technology, and scientific analysis, and ethics;
- international security and diplomacy;
- comparative politics, cultures, and societies; and
- international political economy.

Graduates of the BS INTA program are prepared for advanced graduate and professional study and are ready for employment in internationally oriented firms, government agencies, and nonprofit organizations.

International Affairs majors are expected to enhance their education through participation in the International Plan, study abroad programs, internships, and a host of on- and off-campus programs. In addition to the numerous opportunities afforded through Georgia Tech's Office of International Education, the Sam Nunn School sponsors rigorous summer study abroad programs in the European Union (GT Europe and Brussels), East Asia (Japan), South Asia (Cambodia, Singapore, Thailand), Latin America (Argentina and Brazil), and Iberia (Portugal and Spain). Recognizing the importance of professional experience in enhancing a student's education, the Sam Nunn School encourages majors to pursue an internship or participate in the Cooperative Plan in their field of interest. In addition, students are strongly encouraged to get involved in a range of extracurricular activities, including Model United Nations; AIESEC; Sigma Iota Rho (the International Affairs honor society); the Center for International Strategy, Technology, and Policy; the International Affairs Student Organization; and student conferences. Students are actively involved in the guest lecture series and participate in the biennial Sam Nunn/Bank of America Policy Forum.

INTA Undergraduate Information

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1315	Introduction to Media Computation	3
Core C - Humanities		
Modern Languages [2]		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Select one of the following:		3
HTS 1031	Europe Since the Renaissance	
HTS 2036	Revolutionary Europe: 1789-1914	
HTS 2037	Twentieth Century Europe: 1914 to Present	
HTS 2040	History of Islamic Societies	
HTS 2041	History of the Modern Middle East	
HTS 2061	Traditional Asia and Its Legacy	
HTS 2062	Asia in the Modern World	
HTS 3028	Ancient Greece: Gods, Heroes, and RuinS	
HTS 3029	Ancient Rome: From Greatness to Ruins	
HTS 3030	Medieval Europe: 350 to 1400	
HTS 3031	European Labor History	
HTS 3032	Modern European Intellectual History	
HTS 3033	Medieval England	
HTS 3035	Britain from 1815-1914	
HTS 3036	Britain Since 1914	
HTS 3038	The French Revolution	
HTS 3039	Modern France	
HTS 3041	Modern Spain	
HTS 3043	Modern Germany	
HTS 3045	Nazi Germany and the Holocaust	
HTS 3046	Science, Polilitics, and Culture in Nazi Germany	
HTS 3051	Women and the Politics of Gender in the Middle East	
HTS 3061	Modern China	
HTS 3062	Modern Japan	
HTS 3063	Outposts of Empire: Comparative History of British	
HTS 3065	History of Global Societies	
HTS 3067	Revolutionary Movements in the Modern World	
HTS 3069	Modern Cuba	
INTA 1110	Introduction to International Relations [2]	3
Core F - Courses Related to Major		
INTA 2010	Empirical Methods [2]	3
INTA 2040	Science, Technology, and International Affairs [2]	3
Select nine hours of INTA electives: [2]		9
INTA electives	INTA 1000/2000-level courses	

Select one of the following: [4]		3
BMED 2400	Introduction to Bioengineering Statistics	
CP 4510	Fundamentals of Geographic Information Systems	
CS 1301	Introduction to Computing	
CS 1315	Introduction to Media Computation	
CS 1316	Representing Structure and Behavior	
CS 1331	Introduction to Object Oriented Programming	
CS 2316	Data Manipulation for Science and Industry	
EAS 3110	Energy, Environment, and Society	
EAS 4480	Environmental Data Analysis	
ECE 2020	Digital System Design	
ID 3103	Industrial Design Computing I	
LMC 3402	Graphic and Visual Design	
LMC 3410	The Rhetoric of Nonlinear Documents	
ME 2016	Computer Applications	
MGT 2210	Information Systems and Digital Transformation	
MGT 4051	Decision Support and Expert Systems	
MGT 4052	Systems Analysis and Design	
Major Requirements		
INTA 2001	Careers in International Affairs	1
INTA 3110	U.S. Foreign Policy [2]	3
INTA 3203	Comparative Politics [2]	3
INTA 3301	International Political Economy [2]	3
INTA 4500	Pro-Seminar in International Affairs [2]	3
Additional INTA Electives		
INTA Electives 3/4000 level [2]		12
Modern Languages [1]		6
Non-Major Cluster		
Non-Major Cluster [3]		15
Free Electives		
Free Electives		13
Total Credit Hours		**122**

1. Students must complete twelve credit hours of the same language. Six credit hours are counted in Humanities, and six in major requirements.
2. Minimum grade of C required.
3. 15 credits required in either the same prefix or part of a coherent theme. Please consult with advisor on course selection.
4. Technical elective.

5. Students must complete 39 hours of upper division (3000/4000-level courses). Fifteen hours of the non-major cluster, free electives, language, HTS, or technical elective requirements must be upper division (3000/4000-level coursework). See https://catalog.gatech.edu/rules/13/.

For all language courses, the language of instruction must be the same as the language of learning. English-taught culture courses will not apply to language requirements.

Research Option

The Sam Nunn School of International Affairs also participates in the Research Option plan offered by the Undergraduate Research Opportunities Program (UROP). The Research Option offers students the opportunity for in-depth research experience working under the guidance of a faculty mentor. Requirements for participation in the Research Option include completing nine hours of undergraduate research, at least six of which are on the same topic, writing a research proposal, taking two 1-hour courses: LMC 4701 Undergraduate Research Proposal Writing (typically taken during the first or second semester of research) and LMC 4702 Undergraduate Research Thesis Writing (taken during the term in which the thesis is written), and completing the thesis. Students are also required to send a weekly update of progress of research to the faculty mentor. Along with their application, students must explain how the faculty mentor's research experience will benefit the student's research.

International Plan

International Affairs majors with the International Plan are engaged in a combination of study, research, or internship abroad for a total of twenty-six weeks. This overseas experience must be obtained over two terms (a summer and semester, or two semesters). In addition to gaining advanced global competence, the International Plan designation will set INTA students apart from other applicants with recruiters from top companies and governmental agencies. Required coursework for the International Plan is easily satisfied by the International Affairs core curriculum as follows:

Code	Title	Credit Hours
INTA 1110	Introduction to International Relations [1]	3
INTA 3301	International Political Economy [2]	3
Select one of the following: [3]		3
INTA 3203	Comparative Politics	
INTA approved elective or upper-division Modern Language course		
Select one of the following: [4]		3
INTA 4500	Pro-Seminar in International Affairs	
ML 4500	Intercultural Seminar	
Total Credit Hours		**12**

1. focuses on international relations historically and theoretically
2. provides a historical and theoretical understanding of the global economy, including topics such as international trade, finance, investment, and production; regional economic integration, economic development and modernization; and questions of natural resource sustainability
3. provides familiarity with an area of the world or a country that allows students to make systematic comparisons with their own society and culture
4. A culminating course, occurring either at the end of or after the international experience that integrates knowledge of the discipline and the international experience in a global context.

BS/MS International Affairs

The Sam Nunn School of International Affairs offers a BS/MS program for students enrolled in the International Affairs undergraduate program who demonstrate an interest in and ability for additional education beyond the BS degree.

Students in the BS/MS program will remain undergraduates until they meet requirements for the undergraduate degree, at which point they will

receive their BS degree and be changed to graduate status. Students will be eligible to apply for the program after completion of 45 semester credit hours at Georgia Tech (i.e., at the end of their third semester), and if they show appropriate progress in their degree program thereafter. Any student in good standing in the BS INTA program is eligible to apply to the program. Admissions decisions will be based on GPA and judgments of the faculty who have served as advisors or instructors. Continuation in the program will require the student to maintain a GPA of 3.5 or higher in Ivan Allen College courses. The program will not penalize students who opt out after the bachelor's degree. Students participating in this program will be eligible for the six semester credit-hour Graduate Course Option, which allows students completing both the bachelor's and master's in the same discipline to use up to 6 credit hours of graduate-level coursework in the major discipline for both degrees.

The Graduate-level Credits Required in the BS/MS Program are usually as follows:

Code	Title	Credit Hours
Core (includes 6 hours of shared courses)		15
Electives		24
Technical Requirement		3
Total Credit Hours		**42**

Specific Requirements for the Program

Code	Title	Credit Hours
INTA 6202	Comparative Politics (Taken at Undergraduate Level)	3
INTA 6302	International Political Economy (Taken at Undergraduate Level)	3
INTA 6003	Empirical Research Methods	3
INTA 6102	International Relations Theory	3
INTA 6103	International Security	3
MS Track and Free Electives		24
Technical Requirement (or, INTA/Free elective, if waived)		3
Total Credit Hours		**42**

Contact the BS/MS program director for further information.
https://inta.gatech.edu/programs/graduate/five-year-bsms-inta

INTA Undergraduate Information

BACHELOR OF SCIENCE IN LITERATURE, MEDIA, AND COMMUNICATION

The BS in Literature, Media, and Communication (formerly named Science, Technology, and Culture) is the oldest undergraduate degree program in the Ivan Allen College for the Liberal Arts at Georgia Tech. This program offers a thorough education in the different modes of representation that structure our increasingly technological and global world. Program graduates will have both significant theoretical and hands-on experience with novels, films, games, comic books, web pages, and scientific documents. By learning the modes of communication common to science, technology, and the humanities, LMC graduates are prepared to become leaders in education, business, professions such as medicine and law, and the arts.

LMC students take classes across six paths or "threads" of study, eventually choosing two threads as their major fields of study. These threads include Literature; Media; Communication; Social Justice; Design; and Science, Technology, and Culture. This prepares them for fields including marketing, graphic design, videography, and educational policy. Many LMC alumni go on to graduate school in literature, communication sciences, and interactive entertainment studies or professional school in law, health, and social work. Other graduates pursue careers in fields ranging from graphic art and photography to client advocacy and medical administration to arts administration.

LMC Information

- Bachelor of Science in Literature, Media, and Communication - Thread: Literature & Media
- Bachelor of Science in Literature, Media, and Communication - Thread: Literature & Communication
- Bachelor of Science in Literature, Media, and Communication - Thread: Literature & Design
- Bachelor of Science in Literature, Media, and Communication - Thread: Literature & Social Justice
- Bachelor of Science in Literature, Media, and Communication - Thread: Literature & Science, Technology, and Culture
- Bachelor of Science in Literature, Media, and Communication - Thread: Media & Communication
- Bachelor of Science in Literature, Media, and Communication - Thread: Media & Design
- Bachelor of Science in Literature, Media, and Communication - Thread: Media & Social Justice
- Bachelor of Science in Literature, Media, and Communication - Thread: Media & Science, Technology and Culture
- Bachelor of Science in Literature, Media, and Communication - Thread: Communication & Design
- Bachelor of Science in Literature, Media, and Communication - Thread: Communication & Social Justice
- Bachelor of Science in Literature, Media, and Communication - Thread: Communication & Science, Technology, and Culture
- Bachelor of Science in Literature, Media, and Communication - Thread: Design & Social Justice
- Bachelor of Science in Literature, Media, and Communication - Thread: Design & Science, Technology, and Culture
- Bachelor of Science in Literature, Media, and Communication - Thread: Social Justice and Science, Technology, and Culture

International Plan (All Thread Combinations)

The LMC International Plan follows the Institute model to develop a global competence connected to the student's major program of study. It thus integrates international studies and experiences with work in a broad range of cultural and media studies, preparing graduates to critique and create cultural texts within an international professional environment. All students who successfully complete this option will receive the "International Plan" designation on their transcripts.

While following the basic LMC program of instruction, requiring a total of 122 credit hours of coursework, students following the International Plan will modify their program as follows. They will:

- take three Social Science courses, one each from the following categories: international relations, global economics, and a course on a specific country or region;
- spend two terms abroad engaged in any combination of study abroad, research, or internship;
- complete twelve credit hours of language instruction (by dedicating six credit hours of humanities electives, 3 credit hours of free electives, and 3 credit hours of the LMC language requirement to language study); and
- complete a LMC capstone course that links international studies with the major.

While all of the LMC degree combinations provide students with 14 credit hours of free electives, different options provide students with different numbers of free LMC elective hours. Students should contact the LMC advisor to learn about options for particular thread combinations.
LMC **Information**

Research Option (All Thread Combinations)

This degree option offers LMC students on all degree tracks the opportunity for a substantial, in-depth research experience. Students who pursue this degree option will learn how to design and complete advanced, multi-semester research projects through a combination of independent research, group writing instruction, and one-to-one work with a faculty mentor. Students are strongly encouraged at the end of their experience to work with their faculty mentor to develop a journal publication or conference presentation on the research in addition to the actual thesis. All students who successfully complete the research thesis option will receive the "research option" designation on their transcripts.

To fulfill the requirements of the LMC Research Option, students must:

Code	Title	Credit Hours
LMC 2699/4699	Undergraduate Research [1]	6
LMC 4701	Undergraduate Research Proposal Writing	1
LMC 4702	Undergraduate Research Thesis Writing	1
LMC 4102	Senior Thesis	3

Students will meet these requirements without adding additional hours to their schedules by

- Dedicating six credit hours of undefined LMC elective and/or free elective credit hours to undergraduate research
- Dedicating two more credit hours of free elective credit to LMC 4701 and LMC 4702
- Dedicating 3 hours of capstone coursework in the LMC major to LMC 4102: Senior Thesis.

[1] Students may substitute audit hours of LMC 2698/LMC 4698 for equivalent hours of LMC 2699/LMC 4699. If they elect this option, they must add corresponding credit hours of an elective, for-credit class. While all of the LMC degree thread combinations provide students with 14 credit hours of free electives, different options provide students with different numbers of free LMC elective hours. Students should contact the LMC advisor to learn about options for particular thread combinations.

LMC Information

BS/MS Degree Program

Students who wish to pursue the BS/MS combination in LMC and DM must apply to the School after completing at least seventy-five credit hours of work toward an LMC degree that includes the Interaction Design thread. Applicants should have a 3.5 GPA.

Students admitted to the program will select the LMC 4000 seminar option and take a total of twelve credit hours of graduate coursework during their final undergraduate year. Six credit hours of that work, in DM media courses, will replace the LMC free electives and will count for both undergraduate and graduate credit. During the summer term after their fourth year, students will participate in an approved internship program. During the fifth year, students will take a total of twenty-four credit hours, including either LMC 6800 (Project) or LMC 7000 (Thesis), and with no more than three courses taken outside the DM program.

Bachelor of Science in Literature, Communication, and Media: Thread - Communication & Design

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics [6]	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
International Requirement [1]		3
Any SS		6
Core F - Courses Related to Major		
Technical Electives [2]		6
Ethics Requirement [5]		3
LMC 2000	Introduction to Literature, Media, and Communication	3
Select two of the following: [3,7]		6
LMC 2050	Seminar in Literature, Media, and Communication	
LMC 2060	Introduction to Literary Studies	
LMC 2100	Introduction to Science, Technology and Culture	
LMC 2200	Introduction to Gender Studies	
LMC 2350	Introduction to Social Justice	
LMC 2400	Introduction to Media Studies	
LMC 2450	Introduction to Black Media Studies	
LMC 2500	Introduction to Film	
LMC 2600	Introduction to Performance Studies	
Capstone		
Select one of the following: [3]		3
LMC 4000	Senior Seminar in Literature, Media, and Communication	
or LMC 4	Seminar in Film Studies	
or LMC 4	Senior Thesis	
Concentration		
Design		
LMC 2720	Principles of Visual Design [3]	3
Select two Foundation courses: [3]		6
LMC 2400	Introduction to Media Studies	
LMC 2410	Introduction to Game Studies	

LMC 2700	Introduction to Computational Media	
LMC 2730	Constructing the Moving Image	
LMC 3314	Technologies of Representation	
LMC 3705	Principles of Information Design	
LMC 3710	Principles of Interaction Design	
LMC 4725	Games Design as a Cultural Practice	
LMC 4733	Mixed Reality Experience Design	
Select three Specialty courses: [3]		9
LMC 3106	The Age of Scientific Revolution	
LMC 3206	Communication and Culture	
LMC 3306	Science, Technology, and Race	
LMC 3308	Environmentalism and Ecocriticism	
LMC 3318	Biomedicine and Culture	
LMC 3403	Technical Communication, Theory and Practice	
LMC 3404	Social Media	
LMC 3406	Video Production	
LMC 3407	Advanced Video Production	
LMC 3408	The Rhetoric of Technical Narratives	
LMC 3411	The Rhetoric of Visual Communication	
LMC 3412	Communicating Science and Technology to the Public	
LMC 3813	Special Topics	
LMC 4720	Interactive Narrative	
LMC 4730	Experimental Digital Art	
Communication		
LMC 3403	Technical Communication, Theory and Practice [3]	3
Select two Foundation courses: [3]		6
LMC 2400	Introduction to Media Studies	
LMC 2720	Principles of Visual Design	
LMC 3206	Communication and Culture	
LMC 3310	The Rhetoric of Scientific Inquiry	
LMC 3402	Graphic and Visual Design	
LMC 3404	Social Media	
LMC 3405	Media, Culture, and Society	
LMC 3406	Video Production	
LMC 3408	The Rhetoric of Technical Narratives	
LMC 3411	The Rhetoric of Visual Communication	
LMC 3412	Communicating Science and Technology to the Public	
Select three Specialty courses: [3]		9
LMC 3214	Science Fiction	
LMC 3215	Science Fiction Film and Television	
LMC 3225	Gender Studies in the Disciplines	
LMC 3236	Writing for the Stage and Screen	
LMC 3252	Studies in Film and Television	
LMC 3302	Science, Technology, and Ideology	
LMC 3314	Technologies of Representation	
LMC 3318	Biomedicine and Culture	
LMC 3402	Graphic and Visual Design	
LMC 3520	Contemporary Issues in Literature & Culture	
LMC 3705	Principles of Information Design	
LMC 3710	Principles of Interaction Design	
LMC 3813	Special Topics	
LMC 4406	Contemporary Issues in Professional Communication	
LMC 4720	Interactive Narrative	
LMC Electives [3]		6
Free Electives		
Free Electives		14
Total Credit Hours		**122**

1. Must be selected from the following list: Allow ECON 2101 or ECON 3300 or ECON 4311 or ECON 4350 or ECON 4351 or ECON 4355 or ECON 4411 or ECON 4415 or ECON 4620 or HTS 1031 or HTS 2036 or HTS 2037 or HTS 2041 or HTS 2061 or HTS 2062 or HTS 2082 or HTS 3012 or HTS 3015 or HTS 3028 or HTS 3030 or HTS 3031 or HTS 3032 or HTS 3035 or HTS 3036 or HTS 3038 or HTS 3039 or HTS 3041 or HTS 3043 or HTS 3045 or HTS 3051 or HTS 3061 or HTS 3062 or HTS 3063 or HTS 3064 or HTS 3065 or HTS 3069 or HTS 3087 or INTA 1110 or INTA 2030 or INTA 2040 or INTA 2100 or INTA 2210 or INTA 2220 or INTA 2230 or INTA 3010 or INTA 3020 or INTA 3031 or INTA 3101 or INTA 3102 or INTA 3104 or INTA 3120 or INTA 3121 or INTA 3130 or INTA 3131 or INTA 3203 or INTA 3220 or INTA 3221 or INTA 3230 or INTA 3231 or INTA 3240 or INTA 3241 or INTA 3301 or INTA 3303 or INTA 3304 or INTA 3321 or INTA 3330 or INTA 3331 or INTA 4007 or INTA 4011 or INTA 4040 or INTA 4050 or INTA 4060 or INTA 4101 or INTA 4121 or INTA 4230 orINTA 4240 or INTA 4241 or INTA 4330 or INTA 4331 or INTA 4332 or INTA 4333 or INTA 4340
2. Any CoS or CS course.
3. Minimum grade of C required.
4. Any Modern Language 2000-level or higher.
5. Students must complete one 2000-level or higher Ethics course during their program.
6. Other Core D Math Options include:MATH 1551 and MATH 1554, MATH 1551 and MATH 1564, MATH 1550 and MATH 1553, MATH 1550 and MATH 1554, or MATH 1550 and MATH 1564.
7. Classes applied here cannot double count toward any thread requirements.

Bachelor of Science in Literature, Media, and Communication - Thread: Communication & Science, Technology, and Culture

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		

CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics [6]	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
International Requirement [1]		3
Any SS		6
Core F - Courses Related to Major		
Technical Electives [2]		6
Ethics Requirement [5]		3
LMC 2000	Introduction to Literature, Media, and Communication	3
Select two of the following: [3,7]		6
LMC 2050	Seminar in Literature, Media, and Communication	
LMC 2060	Introduction to Literary Studies	
LMC 2100	Introduction to Science, Technology and Culture	
LMC 2200	Introduction to Gender Studies	
LMC 2350	Introduction to Social Justice	
LMC 2400	Introduction to Media Studies	
LMC 2450	Introduction to Black Media Studies	
LMC 2500	Introduction to Film	
LMC 2600	Introduction to Performance Studies	
Major Requirements		
Select one of the following: [3]		3
LMC 4000	Senior Seminar in Literature, Media, and Communication	
or LMC 4	Seminar in Film Studies	
or LMC 4	Senior Thesis	
Concentration		
Science, Technology and Culture		
LMC 2100	Introduction to Science, Technology and Culture [3]	3
Select two Foundation courses: [3]		6
LMC 3104	The Age of Scientific Discovery	
LMC 3106	The Age of Scientific Revolution	
LMC 3112	Evolution and the Industrial Age	
LMC 3214	Science Fiction	
LMC 3215	Science Fiction Film and Television	
LMC 3310	The Rhetoric of Scientific Inquiry	
LMC 3318	Biomedicine and Culture	
LMC 3302	Science, Technology, and Ideology	
LMC 3304	Science, Technology, and Gender	
LMC 3306	Science, Technology, and Race	
Select three Specialty courses: [3]		9
LMC 3206	Communication and Culture	
LMC 3219	Literature and Medicine	
LMC 3225	Gender Studies in the Disciplines	
LMC 3257	Global Cinema	
LMC 3308	Environmentalism and Ecocriticism	
LMC 3314	Technologies of Representation	
LMC 3352	Film and/as Technology	
LMC 3403	Technical Communication, Theory and Practice	
LMC 3404	Social Media	
LMC 3405	Media, Culture, and Society	
LMC 3411	The Rhetoric of Visual Communication	
LMC 3813	Special Topics	
LMC 4725	Games Design as a Cultural Practice	
LMC 4730	Experimental Digital Art	
LMC 4733	Mixed Reality Experience Design	
Communication		
LMC 3403	Technical Communication, Theory and Practice	3
Select two Foundation courses:		6
LMC 2400	Introduction to Media Studies	
LMC 2720	Principles of Visual Design	
LMC 3206	Communication and Culture	
LMC 3310	The Rhetoric of Scientific Inquiry	
LMC 3404	Social Media	
LMC 3405	Media, Culture, and Society	
LMC 3406	Video Production	
LMC 3408	The Rhetoric of Technical Narratives	
LMC 3411	The Rhetoric of Visual Communication	
LMC 3412	Communicating Science and Technology to the Public	
Select three Specialty courses:		9
LMC 3214	Science Fiction	
LMC 3215	Science Fiction Film and Television	
LMC 3225	Gender Studies in the Disciplines	
LMC 3236	Writing for the Stage and Screen	
LMC 3252	Studies in Film and Television	
LMC 3302	Science, Technology, and Ideology	
LMC 3314	Technologies of Representation	
LMC 3318	Biomedicine and Culture	
LMC 3402	Graphic and Visual Design	
LMC 3520	Contemporary Issues in Literature & Culture	
LMC 3705	Principles of Information Design	
LMC 3710	Principles of Interaction Design	
LMC 3813	Special Topics	
LMC 4602	Performance Practicum	
LMC 4720	Interactive Narrative	
LMC Electives [3]		6

Free Electives		
Free Electives		14
Total Credit Hours		**122**

1 Must be selected from the following list: Allow ECON 2101 or ECON 3300 or ECON 4311 or ECON 4350 or ECON 4351 or ECON 4355 or ECON 4411 or ECON 4415 or ECON 4620 or HTS 1031 or HTS 2036 or HTS 2037 or HTS 2041 or HTS 2061 or HTS 2062 or HTS 2082 or HTS 3012 or HTS 3015 or HTS 3028 or HTS 3030 or HTS 3031 or HTS 3032 or HTS 3035 or HTS 3036 or HTS 3038 or HTS 3039 or HTS 3041 or HTS 3043 or HTS 3045 or HTS 3051 or HTS 3061 or HTS 3062 or HTS 3063 or HTS 3064 or HTS 3065 or HTS 3069 or HTS 3087 or INTA 1110 or INTA 2030 or INTA 2040 or INTA 2100 or INTA 2210 or INTA 2220 or INTA 2230 or INTA 3010 or INTA 3020 or INTA 3031 or INTA 3101 or INTA 3102 or INTA 3104 or INTA 3120 or INTA 3121 or INTA 3130 or INTA 3131 or INTA 3203 or INTA 3220 or INTA 3221 or INTA 3230 or INTA 3231 or INTA 3240 or INTA 3241 or INTA 3301 or INTA 3303 or INTA 3304 or INTA 3321 or INTA 3330 or INTA 3331 or INTA 4007 or INTA 4011 or INTA 4040 or INTA 4050 or INTA 4060 or INTA 4101 or INTA 4121 or INTA 4230 orINTA 4240 or INTA 4241 or INTA 4330 or INTA 4331 or INTA 4332 or INTA 4333 or INTA 4340

2 Any CoS or CS course.

3 Minimum grade of C required.

4 Any Modern Language 2000-level or higher.

5 Students must complete one 2000-level or higher Ethics course during their program.

6 Other Core D Math Options include:MATH 1551 and MATH 1554, MATH 1551 and MATH 1564, MATH 1550 and MATH 1553, MATH 1550 and MATH 1554, or MATH 1550 and MATH 1564.

7 Classes applied here cannot double count toward any thread requirements.

Bachelor of Science in Literature, Media, and Communication - Thread: Communication & Social Justice

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics [6]	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
International Requirement [1]		3
Any SS		6
Core F - Courses Related to Major		
Technical Electives [2]		6
Ethics Requirement [5]		3
LMC 2000	Introduction to Literature, Media, and Communication	3
Select two of the following: [3,7]		6
LMC 2050	Seminar in Literature, Media, and Communication	
LMC 2060	Introduction to Literary Studies	
LMC 2100	Introduction to Science, Technology and Culture	
LMC 2200	Introduction to Gender Studies	
LMC 2350	Introduction to Social Justice	
LMC 2400	Introduction to Media Studies	
LMC 2450	Introduction to Black Media Studies	
LMC 2500	Introduction to Film	
LMC 2600	Introduction to Performance Studies	
Major Requirements		
Select one of the following: [3]		3
LMC 4000	Senior Seminar in Literature, Media, and Communication	
or LMC 4	Seminar in Film Studies	
or LMC 4	Senior Thesis	
Concentration		
Social Justice		
LMC 2350	Introduction to Social Justice	3
Select two Foundation courses: [3]		6
LMC 2200	Introduction to Gender Studies	
LMC 3208	African American Literature and Culture	
LMC 3210	Ethnicity in American Culture	
LMC 3212	Women, Literature, and Culture	
LMC 3219	Literature and Medicine	
LMC 3225	Gender Studies in the Disciplines	
LMC 3302	Science, Technology, and Ideology	
LMC 3304	Science, Technology, and Gender	
LMC 3306	Science, Technology, and Race	
LMC 3318	Biomedicine and Culture	
Select three Specialty courses: [3]		9
LMC 3104	The Age of Scientific Discovery	
LMC 3106	The Age of Scientific Revolution	

LMC 3112	Evolution and the Industrial Age	
LMC 3202	Studies in Fiction	
LMC 3214	Science Fiction	
LMC 3257	Global Cinema	
LMC 3258	Documentary Film	
LMC 3263	Music, Culture, and Society	
LMC 3308	Environmentalism and Ecocriticism	
LMC 3316	Science, Technology, and Postcolonialism	
LMC 3404	Social Media	
LMC 3405	Media, Culture, and Society	
LMC 3511	American Literature & Culture	
LMC 3520	Contemporary Issues in Literature & Culture	
LMC 3813	Special Topics	
Communication		
LMC 3403	Technical Communication, Theory and Practice [3]	3
Select two Foundation courses: [3]		6
LMC 2400	Introduction to Media Studies	
LMC 2720	Principles of Visual Design	
LMC 3206	Communication and Culture	
LMC 3310	The Rhetoric of Scientific Inquiry	
LMC 3404	Social Media	
LMC 3405	Media, Culture, and Society	
LMC 3408	The Rhetoric of Technical Narratives	
LMC 3406	Video Production	
LMC 3411	The Rhetoric of Visual Communication	
LMC 3412	Communicating Science and Technology to the Public	
Select three Specialty courses: [3]		9
LMC 3214	Science Fiction	
LMC 3215	Science Fiction Film and Television	
LMC 3225	Gender Studies in the Disciplines	
LMC 3236	Writing for the Stage and Screen	
LMC 3252	Studies in Film and Television	
LMC 3302	Science, Technology, and Ideology	
LMC 3314	Technologies of Representation	
LMC 3318	Biomedicine and Culture	
LMC 3402	Graphic and Visual Design	
LMC 3520	Contemporary Issues in Literature & Culture	
LMC 3705	Principles of Information Design	
LMC 3710	Principles of Interaction Design	
LMC 4406	Contemporary Issues in Professional Communication	
LMC 4720	Interactive Narrative	
LMC Electives [3]		6
Free Electives		
Free Electives		14
Total Credit Hours		**122**

1 Must be selected from the following list: Allow ECON 2101 or ECON 3300 or ECON 4311 or ECON 4350 or ECON 4351 or ECON 4355 or ECON 4411 or ECON 4415 or ECON 4620 or HTS 1031 or HTS 2036 or HTS 2037 or HTS 2041 or HTS 2061 or HTS 2062 or HTS 2082 or HTS 3012 or HTS 3015 or HTS 3028 or HTS 3030 or HTS 3031 or HTS 3032 or HTS 3035 or HTS 3036 or HTS 3038 or HTS 3039 or HTS 3041 or HTS 3043 or HTS 3045 or HTS 3051 or HTS 3061 or HTS 3062 or HTS 3063 or HTS 3064 or HTS 3065 or HTS 3069 or HTS 3087 or INTA 1110 or INTA 2030 or INTA 2040 or INTA 2100 or INTA 2210 or INTA 2220 or INTA 2230 or INTA 3010 or INTA 3020 or INTA 3031 or INTA 3101 or INTA 3102 or INTA 3104 or INTA 3120 or INTA 3121 or INTA 3130 or INTA 3131 or INTA 3203 or INTA 3220 or INTA 3221 or INTA 3230 or INTA 3231 or INTA 3240 or INTA 3241 or INTA 3301 or INTA 3303 or INTA 3304 or INTA 3321 or INTA 3330 or INTA 3331 or INTA 4007 or INTA 4011 or INTA 4040 or INTA 4050 or INTA 4060 or INTA 4101 or INTA 4121 or INTA 4230 orINTA 4240 or INTA 4241 or INTA 4330 or INTA 4331 or INTA 4332 or INTA 4333 or INTA 4340

2 Any CoS or CS course.

3 Minimum grade of C required.

4 Any Modern Language 2000-level or higher.

5 Students must complete one 2000-level or higher Ethics course during their program.

6 Other Core D Math Options include:MATH 1551 and MATH 1554, MATH 1551 and MATH 1564, MATH 1550 and MATH 1553, MATH 1550 and MATH 1554, or MATH 1550 and MATH 1564.

7 Classes applied here cannot double count toward any thread requirements.

Bachelor of Science in Literature, Communication, and Media: Thread - Design & Science, Technology, & Culture

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics [6]	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	

HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
International Requirement [1]		3
Any SS		6
Core F - Courses Related to Major		
Technical Electives [2]		6
Ethics Requirement [5]		3
LMC 2000	Introduction to Literature, Media, and Communication	3
Select two of the following: [3,7]		6
LMC 2050	Seminar in Literature, Media, and Communication	
LMC 2060	Introduction to Literary Studies	
LMC 2100	Introduction to Science, Technology and Culture	
LMC 2200	Introduction to Gender Studies	
LMC 2350	Introduction to Social Justice	
LMC 2400	Introduction to Media Studies	
LMC 2450	Introduction to Black Media Studies	
LMC 2500	Introduction to Film	
LMC 2600	Introduction to Performance Studies	
Major Requirements		
Select one of the following:		3
LMC 4000	Senior Seminar in Literature, Media, and Communication	
or LMC 4	Seminar in Film Studies	
or LMC 4	Senior Thesis	
Concentration		
Design		
LMC 2720	Principles of Visual Design [3]	3
Select two Foundations courses: [3]		6
LMC 2400	Introduction to Media Studies	
LMC 2410	Introduction to Game Studies	
LMC 2700	Introduction to Computational Media [3]	
LMC 2730	Constructing the Moving Image	
LMC 3314	Technologies of Representation	
LMC 3402	Graphic and Visual Design	
LMC 3705	Principles of Information Design	
LMC 3710	Principles of Interaction Design	
LMC 4725	Games Design as a Cultural Practice	
LMC 4733	Mixed Reality Experience Design	
Select three Specialty courses: [3]		9
LMC 3106	The Age of Scientific Revolution	
LMC 3206	Communication and Culture	
LMC 3306	Science, Technology, and Race	
LMC 3318	Biomedicine and Culture	
LMC 3403	Technical Communication, Theory and Practice	
LMC 3404	Social Media	
LMC 3407	Advanced Video Production	
LMC 3408	The Rhetoric of Technical Narratives	
LMC 3411	The Rhetoric of Visual Communication	
LMC 3412	Communicating Science and Technology to the Public	
LMC 4720	Interactive Narrative	
LMC 3813	Special Topics	
LMC 4730	Experimental Digital Art	
Science, Technology, and Culture		
LMC 2100	Introduction to Science, Technology and Culture [3]	3
Select two Foundations courses: [3]		6
LMC 3104	The Age of Scientific Discovery	
LMC 3106	The Age of Scientific Revolution	
LMC 3112	Evolution and the Industrial Age	
LMC 3214	Science Fiction	
LMC 3215	Science Fiction Film and Television	
LMC 3310	The Rhetoric of Scientific Inquiry	
LMC 3318	Biomedicine and Culture	
LMC 3302	Science, Technology, and Ideology	
LMC 3304	Science, Technology, and Gender	
LMC 3306	Science, Technology, and Race	
Select three Specialty courses: [3]		9
LMC 3206	Communication and Culture	
LMC 3219	Literature and Medicine	
LMC 3225	Gender Studies in the Disciplines	
LMC 3257	Global Cinema	
LMC 3308	Environmentalism and Ecocriticism	
LMC 3314	Technologies of Representation	
LMC 3352	Film and/as Technology	
LMC 3403	Technical Communication, Theory and Practice	
LMC 3405	Media, Culture, and Society	
LMC 3411	The Rhetoric of Visual Communication	
LMC 3813	Special Topics	
LMC 4725	Games Design as a Cultural Practice	
LMC 4730	Experimental Digital Art	
LMC 4733	Mixed Reality Experience Design	
LMC Electives [3]		6
Free Electives		
Free Electives		14
Total Credit Hours		**122**

[1] Must be selected from the following list: Allow ECON 2101 or ECON 3300 or ECON 4311 or ECON 4350 or ECON 4351 or ECON 4355 or ECON 4411 or ECON 4415 or ECON 4620 or HTS 1031 or HTS 2036 or HTS 2037 or HTS 2041 or HTS 2061 or HTS 2062 or HTS 2082 or HTS 3012 or HTS 3015 or HTS 3028 or HTS 3030 or HTS 3031 or HTS 3032 or HTS 3035 or HTS 3036 or HTS 3038 or HTS 3039 or HTS 3041 or HTS 3043 or HTS 3045 or HTS 3051 or HTS 3061 or HTS 3062 or HTS 3063 or HTS 3064 or HTS 3065 or HTS 3069 or HTS 3087 or INTA 1110 or INTA 2030 or INTA 2040 or INTA 2100 or INTA 2210 or INTA 2220 or INTA 2230 or INTA 3010 or INTA 3020 or INTA 3031 or INTA 3101 or INTA 3102 or INTA 3104 or INTA 3120 or INTA 3121 or INTA 3130 or INTA 3131 or INTA 3203 or INTA 3220 or INTA 3221 or INTA 3230 or INTA 3231 or INTA 3240 or INTA 3241 or INTA 3301 or INTA 3303 or INTA 3304 or INTA 3321 or INTA 3330 or INTA 3331 or INTA 4007 or INTA 4011 or INTA 4040 or INTA 4050 or

INTA 4060 or INTA 4101 or INTA 4121 or INTA 4230 orINTA 4240 or INTA 4241 or INTA 4330 or INTA 4331 or INTA 4332 or INTA 4333 or INTA 4340

2 Any CoS or CS course.

3 Minimum grade of C required.

4 Any Modern Language 2000-level or higher.

5 Students must complete one 2000-level or higher Ethics course during their program.

6 Other Core D Math Options include:MATH 1551 and MATH 1554, MATH 1551 and MATH 1564, MATH 1550 and MATH 1553, MATH 1550 and MATH 1554, or MATH 1550 and MATH 1564.

7 Classes applied here cannot double count toward any thread requirements.

Bachelor of Science in Literature, Communication, and Media: Thread - Design & Social Justice

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics [6]	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
International Requirement [1]		3
Any SS		6
Core F - Courses Related to Major		
Technical Electives [2]		6
Ethics Requirement [5]		3
LMC 2000	Introduction to Literature, Media, and Communication	3
Select two of the following: [3,7]		6
LMC 2050	Seminar in Literature, Media, and Communication	
LMC 2060	Introduction to Literary Studies	
LMC 2100	Introduction to Science, Technology and Culture	
LMC 2200	Introduction to Gender Studies	
LMC 2350	Introduction to Social Justice	
LMC 2400	Introduction to Media Studies	
LMC 2450	Introduction to Black Media Studies	
LMC 2500	Introduction to Film	
LMC 2600	Introduction to Performance Studies	
Major Requirements		
Select one of the following: [3]		3
LMC 4000	Senior Seminar in Literature, Media, and Communication	
or LMC 4	Seminar in Film Studies	
or LMC 4	Senior Thesis	
Concentration		
Design		
LMC 2720	Principles of Visual Design [3]	3
Select two Foundations courses: [3]		6
LMC 2400	Introduction to Media Studies	
LMC 2410	Introduction to Game Studies	
LMC 2700	Introduction to Computational Media [3]	
LMC 2730	Constructing the Moving Image	
LMC 3314	Technologies of Representation	
LMC 3402	Graphic and Visual Design	
LMC 3705	Principles of Information Design	
LMC 3710	Principles of Interaction Design	
LMC 4725	Games Design as a Cultural Practice	
LMC 4733	Mixed Reality Experience Design	
Select three Specialty courses: [3]		9
LMC 3106	The Age of Scientific Revolution	
LMC 3206	Communication and Culture	
LMC 3306	Science, Technology, and Race	
LMC 3308	Environmentalism and Ecocriticism	
LMC 3318	Biomedicine and Culture	
LMC 3403	Technical Communication, Theory and Practice	
LMC 3406	Video Production	
LMC 3407	Advanced Video Production	
LMC 3408	The Rhetoric of Technical Narratives	
LMC 3411	The Rhetoric of Visual Communication	
LMC 3412	Communicating Science and Technology to the Public	
LMC 3813	Special Topics	
LMC 4720	Interactive Narrative	
LMC 4730	Experimental Digital Art	
Social Justice		
LMC 2350	Introduction to Social Justice	3
Select two Foundations courses: [3]		6

LMC 2200	Introduction to Gender Studies	
LMC 3208	African American Literature and Culture	
LMC 3210	Ethnicity in American Culture	
LMC 3212	Women, Literature, and Culture	
LMC 3219	Literature and Medicine	
LMC 3225	Gender Studies in the Disciplines	
LMC 3302	Science, Technology, and Ideology	
LMC 3304	Science, Technology, and Gender	
LMC 3306	Science, Technology, and Race	
LMC 3318	Biomedicine and Culture	
Select three Specialty courses: [3]		9
LMC 3104	The Age of Scientific Discovery	
LMC 3106	The Age of Scientific Revolution	
LMC 3112	Evolution and the Industrial Age	
LMC 3202	Studies in Fiction	
LMC 3214	Science Fiction	
LMC 3257	Global Cinema	
LMC 3258	Documentary Film	
LMC 3263	Music, Culture, and Society	
LMC 3308	Environmentalism and Ecocriticism	
LMC 3316	Science, Technology, and Postcolonialism	
LMC 3404	Social Media	
LMC 3405	Media, Culture, and Society	
LMC 3511	American Literature & Culture	
LMC 3520	Contemporary Issues in Literature & Culture	
LMC 3813	Special Topics	
LMC Electives [3]		6
Free Electives		
Free Electives		14
Total Credit Hours		**122**

1 Must be selected from the following list: Allow ECON 2101 or ECON 3300 or ECON 4311 or ECON 4350 or ECON 4351 or ECON 4355 or ECON 4411 or ECON 4415 or ECON 4620 or HTS 1031 or HTS 2036 or HTS 2037 or HTS 2041 or HTS 2061 or HTS 2062 or HTS 2082 or HTS 3012 or HTS 3015 or HTS 3028 or HTS 3030 or HTS 3031 or HTS 3032 or HTS 3035 or HTS 3036 or HTS 3038 or HTS 3039 or HTS 3041 or HTS 3043 or HTS 3045 or HTS 3051 or HTS 3061 or HTS 3062 or HTS 3063 or HTS 3064 or HTS 3065 or HTS 3069 or HTS 3087 or INTA 1110 or INTA 2030 or INTA 2040 or INTA 2100 or INTA 2210 or INTA 2220 or INTA 2230 or INTA 3010 or INTA 3020 or INTA 3031 or INTA 3101 or INTA 3102 or INTA 3104 or INTA 3120 or INTA 3121 or INTA 3130 or INTA 3131 or INTA 3203 or INTA 3220 or INTA 3221 or INTA 3230 or INTA 3231 or INTA 3240 or INTA 3241 or INTA 3301 or INTA 3303 or INTA 3304 or INTA 3321 or INTA 3330 or INTA 3331 or INTA 4007 or INTA 4011 or INTA 4040 or INTA 4050 or INTA 4060 or INTA 4101 or INTA 4121 or INTA 4230 orINTA 4240 or INTA 4241 or INTA 4330 or INTA 4331 or INTA 4332 or INTA 4333 or INTA 4340

2 Any CoS or CS course.

3 Minimum grade of C required.

4 Any Modern Language 2000-level or higher.

5 Students must complete one 2000-level or higher Ethics course during their program.

6 Other Core D Math Options include:MATH 1551 and MATH 1554, MATH 1551 and MATH 1564, MATH 1550 and MATH 1553, MATH 1550 and MATH 1554, or MATH 1550 and MATH 1564.

7 Classes applied here cannot double count toward any thread requirements.

Bachelor of Science in Literature, Media, and Communication - Thread: Literature & Communication

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics [6]	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
International Requirement [1]		3
Any SS		6
Core F - Courses Related to Major		
Technical Electives [2]		6
Ethics Requirement [5]		3
LMC 2000	Introduction to Literature, Media, and Communication	3
Select two of the following: [3,7]		6
LMC 2050	Seminar in Literature, Media, and Communication	
LMC 2060	Introduction to Literary Studies	

LMC 2100	Introduction to Science, Technology and Culture	
LMC 2200	Introduction to Gender Studies	
LMC 2350	Introduction to Social Justice	
LMC 2400	Introduction to Media Studies	
LMC 2450	Introduction to Black Media Studies	
LMC 2500	Introduction to Film	
LMC 2600	Introduction to Performance Studies	
Major Requirements		
Select one of the following: [3]		3
LMC 4000	Senior Seminar in Literature, Media, and Communication	
or LMC 4	Seminar in Film Studies	
or LMC 4	Senior Thesis	
Concentration		
Literature		
LMC 2060	Introduction to Literary Studies	3
Select 2 of these Foundation courses: [3]		6
LMC 3202	Studies in Fiction	
LMC 3226	Major Authors	
LMC 3502	Ancient and Medieval Literature and Culture	
LMC 3504	Renaissance Literature and Culture	
LMC 3506	Enlightenment and Culture	
LMC 3511	American Literature & Culture	
LMC 3512	British and Continental Romanticism	
LMC 3514	Victorian Literature and Culture	
LMC 3516	Literary and Cultural Modernism	
LMC 3518	Literary and Cultural Postmodernism	
Select 3 of these Specialty courses: [3]		9
LMC 3102	Science, Technology, and the Classical Tradition	
LMC 3112	Evolution and the Industrial Age	
LMC 3204	Poetry and Poetics	
LMC 3208	African American Literature and Culture	
LMC 3210	Ethnicity in American Culture	
LMC 3212	Women, Literature, and Culture	
LMC 3214	Science Fiction	
LMC 3219	Literature and Medicine	
LMC 3228	Shakespeare	
LMC 3234	Creative Writing	
LMC 3236	Writing for the Stage and Screen	
LMC 3316	Science, Technology, and Postcolonialism	
LMC 3520	Contemporary Issues in Literature & Culture	
LMC 4204	Poetry and Poetics II	
LMC 3813	Special Topics	
Communication		
LMC 3403	Technical Communication, Theory and Practice [3]	3
Select 2 of these Foundation courses: [3]		6
LMC 2400	Introduction to Media Studies	
LMC 2720	Principles of Visual Design	
LMC 3206	Communication and Culture	
LMC 3310	The Rhetoric of Scientific Inquiry	
LMC 3404	Social Media	
LMC 3405	Media, Culture, and Society	
LMC 3406	Video Production	
LMC 3408	The Rhetoric of Technical Narratives	
LMC 3410	The Rhetoric of Nonlinear Documents	
LMC 3412	Communicating Science and Technology to the Public	
Select 3 of these Specialty courses: [3]		9
LMC 3214	Science Fiction	
LMC 3215	Science Fiction Film and Television	
LMC 3225	Gender Studies in the Disciplines	
LMC 3236	Writing for the Stage and Screen	
LMC 3252	Studies in Film and Television	
LMC 3302	Science, Technology, and Ideology	
LMC 3314	Technologies of Representation	
LMC 3318	Biomedicine and Culture	
LMC 3402	Graphic and Visual Design	
LMC 3520	Contemporary Issues in Literature & Culture	
LMC 3705	Principles of Information Design	
LMC 3710	Principles of Interaction Design	
LMC 4406	Contemporary Issues in Professional Communication	
LMC 3411	The Rhetoric of Visual Communication	
LMC 4720	Interactive Narrative	
LMC Electives [3]		6
Free Electives		
Free Electives		14
Total Credit Hours		**122**

1 Must be selected from the following list: Allow ECON 2101 or ECON 3300 or ECON 4311 or ECON 4350 or ECON 4351 or ECON 4355 or ECON 4411 or ECON 4415 or ECON 4620 or HTS 1031 or HTS 2036 or HTS 2037 or HTS 2041 or HTS 2061 or HTS 2062 or HTS 2082 or HTS 3012 or HTS 3015 or HTS 3028 or HTS 3030 or HTS 3031 or HTS 3032 or HTS 3035 or HTS 3036 or HTS 3038 or HTS 3039 or HTS 3041 or HTS 3043 or HTS 3045 or HTS 3051 or HTS 3061 or HTS 3062 or HTS 3063 or HTS 3064 or HTS 3065 or HTS 3069 or HTS 3087 or INTA 1110 or INTA 2030 or INTA 2040 or INTA 2100 or INTA 2210 or INTA 2220 or INTA 2230 or INTA 3010 or INTA 3020 or INTA 3031 or INTA 3101 or INTA 3102 or INTA 3104 or INTA 3120 or INTA 3121 or INTA 3130 or INTA 3131 or INTA 3203 or INTA 3220 or INTA 3221 or INTA 3230 or INTA 3231 or INTA 3240 or INTA 3241 or INTA 3301 or INTA 3303 or INTA 3304 or INTA 3321 or INTA 3330 or INTA 3331 or INTA 4007 or INTA 4011 or INTA 4040 or INTA 4050 or INTA 4060 or INTA 4101 or INTA 4121 or INTA 4230 orINTA 4240 or INTA 4241 or INTA 4330 or INTA 4331 or INTA 4332 or INTA 4333 or INTA 4340

2 Any CoS or CS course.

3 Minimum grade of C required.

4 Any Modern Language 2000-level or higher.

5 Students must complete one 2000-level or higher Ethics course during their program.

6 Other Core D Math Options include:MATH 1551 and MATH 1554, MATH 1551 and MATH 1564, MATH 1550 and MATH 1553, MATH 1550 and MATH 1554, or MATH 1550 and MATH 1564.

[7] Classes applied here cannot double count toward any thread requirements.

Bachelor of Science in Literature, Media, and Communication - Thread: Literature & Design

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics [6]	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
International Requirement [1]		3
Any SS		6
Core F - Courses Related to Major		
Technical Electives [2]		6
Ethics Requirement [5]		3
LMC 2000	Introduction to Literature, Media, and Communication	3
Select two of the following: [3,7]		6
LMC 2050	Seminar in Literature, Media, and Communication	
LMC 2060	Introduction to Literary Studies	
LMC 2100	Introduction to Science, Technology and Culture	
LMC 2200	Introduction to Gender Studies	
LMC 2350	Introduction to Social Justice	
LMC 2400	Introduction to Media Studies	
LMC 2450	Introduction to Black Media Studies	
LMC 2500	Introduction to Film	
LMC 2600	Introduction to Performance Studies	
Major Requirements		
Select one of the following: [3]		3
LMC 4000	Senior Seminar in Literature, Media, and Communication	
or LMC 4	Seminar in Film Studies	
or LMC 4	Senior Thesis	
Concentration		
Literature		
LMC 2060	Introduction to Literary Studies	3
Select two Foundation courses: [3]		6
LMC 3202	Studies in Fiction	
LMC 3226	Major Authors	
LMC 3502	Ancient and Medieval Literature and Culture	
LMC 3504	Renaissance Literature and Culture	
LMC 3506	Enlightenment and Culture	
LMC 3511	American Literature & Culture	
LMC 3512	British and Continental Romanticism	
LMC 3514	Victorian Literature and Culture	
LMC 3516	Literary and Cultural Modernism	
LMC 3518	Literary and Cultural Postmodernism	
Select three Specialty courses: [3]		9
LMC 3102	Science, Technology, and the Classical Tradition	
LMC 3112	Evolution and the Industrial Age	
LMC 3204	Poetry and Poetics	
LMC 3208	African American Literature and Culture	
LMC 3210	Ethnicity in American Culture	
LMC 3212	Women, Literature, and Culture	
LMC 3214	Science Fiction	
LMC 3219	Literature and Medicine	
LMC 3228	Shakespeare	
LMC 3234	Creative Writing	
LMC 3236	Writing for the Stage and Screen	
LMC 3316	Science, Technology, and Postcolonialism	
LMC 3520	Contemporary Issues in Literature & Culture	
LMC 4204	Poetry and Poetics II	
LMC 3813	Special Topics	
Design		
LMC 2720	Principles of Visual Design [3]	3
Select two Foundation courses: [3]		6
LMC 2400	Introduction to Media Studies	
LMC 2410	Introduction to Game Studies	
LMC 2700	Introduction to Computational Media	
LMC 2730	Constructing the Moving Image	
LMC 3314	Technologies of Representation	
LMC 3402	Graphic and Visual Design	
LMC 3705	Principles of Information Design	
LMC 3710	Principles of Interaction Design	

LMC 4725	Games Design as a Cultural Practice	
LMC 4733	Mixed Reality Experience Design	
Select three Specialty courses: [3]		9
LMC 3106	The Age of Scientific Revolution	
LMC 3206	Communication and Culture	
LMC 3306	Science, Technology, and Race	
LMC 3308	Environmentalism and Ecocriticism	
LMC 3318	Biomedicine and Culture	
LMC 3403	Technical Communication, Theory and Practice	
LMC 3404	Social Media	
LMC 3406	Video Production	
LMC 3407	Advanced Video Production	
LMC 3408	The Rhetoric of Technical Narratives	
LMC 3410	The Rhetoric of Nonlinear Documents	
LMC 3412	Communicating Science and Technology to the Public	
LMC 4720	Interactive Narrative	
LMC 3813	Special Topics	
LMC 4730	Experimental Digital Art	
LMC Electives [3]		6
Free Electives		
Free Electives		14
Total Credit Hours		**122**

1. Must be selected from the following list: Allow ECON 2101 or ECON 3300 or ECON 4311 or ECON 4350 or ECON 4351 or ECON 4355 or ECON 4411 or ECON 4415 or ECON 4620 or HTS 1031 or HTS 2036 or HTS 2037 or HTS 2041 or HTS 2061 or HTS 2062 or HTS 2082 or HTS 3012 or HTS 3015 or HTS 3028 or HTS 3030 or HTS 3031 or HTS 3032 or HTS 3035 or HTS 3036 or HTS 3038 or HTS 3039 or HTS 3041 or HTS 3043 or HTS 3045 or HTS 3051 or HTS 3061 or HTS 3062 or HTS 3063 or HTS 3064 or HTS 3065 or HTS 3069 or HTS 3087 or INTA 1110 or INTA 2030 or INTA 2040 or INTA 2100 or INTA 2210 or INTA 2220 or INTA 2230 or INTA 3010 or INTA 3020 or INTA 3031 or INTA 3101 or INTA 3102 or INTA 3104 or INTA 3120 or INTA 3121 or INTA 3130 or INTA 3131 or INTA 3203 or INTA 3220 or INTA 3221 or INTA 3230 or INTA 3231 or INTA 3240 or INTA 3241 or INTA 3301 or INTA 3303 or INTA 3304 or INTA 3321 or INTA 3330 or INTA 3331 or INTA 4007 or INTA 4011 or INTA 4040 or INTA 4050 or INTA 4060 or INTA 4101 or INTA 4121 or INTA 4230 orINTA 4240 or INTA 4241 or INTA 4330 or INTA 4331 or INTA 4332 or INTA 4333 or INTA 4340
2. Any CoS or CS course.
3. Minimum grade of C required.
4. Any Modern Language 2000-level or higher.
5. Students must complete one 2000-level or higher Ethics course during their program.
6. Other Core D Math Options include:MATH 1551 and MATH 1554, MATH 1551 and MATH 1564, MATH 1550 and MATH 1553, MATH 1550 and MATH 1554, or MATH 1550 and MATH 1564.
7. Classes applied here cannot double count toward any thread requirements.

Bachelor of Science in Literature, Media, and Communication - Thread: Literature & Media

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics [6]	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
International Requirement [1]		3
Any SS		6
Core F - Courses Related to Major		
Technical Electives [2]		6
Ethics Requirement [5]		3
LMC 2000	Introduction to Literature, Media, and Communication	3
Select two of the following: [3,7]		6
LMC 2050	Seminar in Literature, Media, and Communication	
LMC 2060	Introduction to Literary Studies	
LMC 2100	Introduction to Science, Technology and Culture	
LMC 2200	Introduction to Gender Studies	
LMC 2350	Introduction to Social Justice	
LMC 2400	Introduction to Media Studies	
LMC 2450	Introduction to Black Media Studies	
LMC 2500	Introduction to Film	

LMC 2600	Introduction to Performance Studies	
Major Requirements		
Select one of the following: [3]		3
LMC 4000	Senior Seminar in Literature, Media, and Communication	
or LMC 4	Seminar in Film Studies	
or LMC 4	Senior Thesis	
Concentration		
Literature		
LMC 2060	Introduction to Literary Studies	3
Select two Foundations courses: [3]		6
LMC 3202	Studies in Fiction	
LMC 3226	Major Authors	
LMC 3502	Ancient and Medieval Literature and Culture	
LMC 3504	Renaissance Literature and Culture	
LMC 3506	Enlightenment and Culture	
LMC 3511	American Literature & Culture	
LMC 3512	British and Continental Romanticism	
LMC 3514	Victorian Literature and Culture	
LMC 3516	Literary and Cultural Modernism	
LMC 3518	Literary and Cultural Postmodernism	
Select three Specialty courses: [3]		9
LMC 3102	Science, Technology, and the Classical Tradition	
LMC 3112	Evolution and the Industrial Age	
LMC 3204	Poetry and Poetics	
LMC 3208	African American Literature and Culture	
LMC 3210	Ethnicity in American Culture	
LMC 3212	Women, Literature, and Culture	
LMC 3214	Science Fiction	
LMC 3219	Literature and Medicine	
LMC 3228	Shakespeare	
LMC 3234	Creative Writing	
LMC 3236	Writing for the Stage and Screen	
LMC 3316	Science, Technology, and Postcolonialism	
LMC 3520	Contemporary Issues in Literature & Culture	
LMC 3813	Special Topics	
LMC 4204	Poetry and Poetics II	
Media		
LMC 2400	Introduction to Media Studies [3]	3
Select two Foundations courses: [3]		6
LMC 2410	Introduction to Game Studies	
LMC 2500	Introduction to Film	
LMC 2600	Introduction to Performance Studies	
LMC 2700	Introduction to Computational Media	
LMC 2720	Principles of Visual Design	
LMC 2730	Constructing the Moving Image	
LMC 3206	Communication and Culture	
LMC 3314	Technologies of Representation	
LMC 3404	Social Media	
LMC 3405	Media, Culture, and Society	
Select three Specialty courses: [3]		9
LMC 3252	Studies in Film and Television	
LMC 3253	Animation	
LMC 3254	Film History	
LMC 3255	Cinema and Digital Culture	
LMC 3256	Major Filmmakers	
LMC 3257	Global Cinema	
LMC 3258	Documentary Film	
LMC 3259	Experimental Film	
LMC 3263	Music, Culture, and Society	
LMC 3352	Film and/as Technology	
LMC 3402	Graphic and Visual Design	
LMC 3406	Video Production	
LMC 3407	Advanced Video Production	
LMC 3813	Special Topics	
LMC 4730	Experimental Digital Art	
LMC 4733	Mixed Reality Experience Design [3]	
LMC Electives [3]		6
Free Electives		
Free Electives		14
Total Credit Hours		**122**

1. Must be selected from the following list: Allow ECON 2101 or ECON 3300 or ECON 4311 or ECON 4350 or ECON 4351 or ECON 4355 or ECON 4411 or ECON 4415 or ECON 4620 or HTS 1031 or HTS 2036 or HTS 2037 or HTS 2041 or HTS 2061 or HTS 2062 or HTS 2082 or HTS 3012 or HTS 3015 or HTS 3028 or HTS 3030 or HTS 3031 or HTS 3032 or HTS 3035 or HTS 3036 or HTS 3038 or HTS 3039 or HTS 3041 or HTS 3043 or HTS 3045 or HTS 3051 or HTS 3061 or HTS 3062 or HTS 3063 or HTS 3064 or HTS 3065 or HTS 3069 or HTS 3087 or INTA 1110 or INTA 2030 or INTA 2040 or INTA 2100 or INTA 2210 or INTA 2220 or INTA 2230 or INTA 3010 or INTA 3020 or INTA 3031 or INTA 3101 or INTA 3102 or INTA 3104 or INTA 3120 or INTA 3121 or INTA 3130 or INTA 3131 or INTA 3203 or INTA 3220 or INTA 3221 or INTA 3230 or INTA 3231 or INTA 3240 or INTA 3241 or INTA 3301 or INTA 3303 or INTA 3304 or INTA 3321 or INTA 3330 or INTA 3331 or INTA 4007 or INTA 4011 or INTA 4040 or INTA 4050 or INTA 4060 or INTA 4101 or INTA 4121 or INTA 4230 orINTA 4240 or INTA 4241 or INTA 4330 or INTA 4331 or INTA 4332 or INTA 4333 or INTA 4340
2. Any CoS or CS course.
3. Minimum grade of C required.
4. Any Modern Language 2000-level or higher.
5. Students must complete one 2000-level or higher Ethics course during their program.
6. Other Core D Math Options include:MATH 1551 and MATH 1554, MATH 1551 and MATH 1564, MATH 1550 and MATH 1553, MATH 1550 and MATH 1554, or MATH 1550 and MATH 1564.
7. Classes applied here cannot double count toward any thread requirements

Bachelor of Science in Literature, Media, and Communication - Thread: Literature & Science, Technology, and Culture

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics [6]	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
International Requirement [1]		3
Any SS		6
Core F - Courses Related to Major		
Technical Electives [2]		6
Ethics Requirement [5]		3
LMC 2600	Introduction to Performance Studies	3
Select two of the following: [3,7]		6
LMC 2050	Seminar in Literature, Media, and Communication	
LMC 2060	Introduction to Literary Studies	
LMC 2100	Introduction to Science, Technology and Culture	
LMC 2200	Introduction to Gender Studies	
LMC 2350	Introduction to Social Justice	
LMC 2400	Introduction to Media Studies	
LMC 2450	Introduction to Black Media Studies	
LMC 2500	Introduction to Film	
LMC 2600	Introduction to Performance Studies	
Major Requirements		
Select one of the following: [3]		3
LMC 4000	Senior Seminar in Literature, Media, and Communication	
or LMC 4	Seminar in Film Studies	
or LMC 4	Senior Thesis	
Concentration		
Literature		
LMC 2060	Introduction to Literary Studies	3
Select two Foundations courses: [3]		6
LMC 3202	Studies in Fiction	
LMC 3226	Major Authors	
LMC 3502	Ancient and Medieval Literature and Culture	
LMC 3504	Renaissance Literature and Culture	
LMC 3506	Enlightenment and Culture	
LMC 3511	American Literature & Culture	
LMC 3512	British and Continental Romanticism	
LMC 3514	Victorian Literature and Culture	
LMC 3516	Literary and Cultural Modernism	
LMC 3518	Literary and Cultural Postmodernism	
Select three Specialty courses: [3]		9
LMC 3102	Science, Technology, and the Classical Tradition	
LMC 3112	Evolution and the Industrial Age	
LMC 3204	Poetry and Poetics	
LMC 3208	African American Literature and Culture	
LMC 3210	Ethnicity in American Culture	
LMC 3212	Women, Literature, and Culture	
LMC 3214	Science Fiction	
LMC 3219	Literature and Medicine	
LMC 3228	Shakespeare	
LMC 3234	Creative Writing	
LMC 3236	Writing for the Stage and Screen	
LMC 3316	Science, Technology, and Postcolonialism	
LMC 3520	Contemporary Issues in Literature & Culture	
LMC 3813	Special Topics	
LMC 4204	Poetry and Poetics II	
Science, Technology, and Culture		
LMC 2100	Introduction to Science, Technology and Culture [3]	3
Select two Foundations courses: [3]		6
LMC 3104	The Age of Scientific Discovery	
LMC 3106	The Age of Scientific Revolution	
LMC 3112	Evolution and the Industrial Age	
LMC 3214	Science Fiction	
LMC 3215	Science Fiction Film and Television	
LMC 3310	The Rhetoric of Scientific Inquiry	
LMC 3318	Biomedicine and Culture	
LMC 3302	Science, Technology, and Ideology	
LMC 3304	Science, Technology, and Gender	
LMC 3306	Science, Technology, and Race	
Select three Specialty courses: [3]		9

LMC 3206	Communication and Culture	
LMC 3219	Literature and Medicine	
LMC 3225	Gender Studies in the Disciplines	
LMC 3257	Global Cinema	
LMC 3308	Environmentalism and Ecocriticism	
LMC 3314	Technologies of Representation	
LMC 3352	Film and/as Technology	
LMC 3403	Technical Communication, Theory and Practice	
LMC 3404	Social Media	
LMC 3405	Media, Culture, and Society	
LMC 3410	The Rhetoric of Nonlinear Documents	
LMC 3813	Special Topics	
LMC 4725	Games Design as a Cultural Practice	
LMC 4730	Experimental Digital Art	
LMC 4733	Mixed Reality Experience Design	
LMC Electives [3]		6
Free Electives		
Free Electives		14
Total Credit Hours		**122**

1. Must be selected from the following list: Allow ECON 2101 or ECON 3300 or ECON 4311 or ECON 4350 or ECON 4351 or ECON 4355 or ECON 4411 or ECON 4415 or ECON 4620 or HTS 1031 or HTS 2036 or HTS 2037 or HTS 2041 or HTS 2061 or HTS 2062 or HTS 2082 or HTS 3012 or HTS 3015 or HTS 3028 or HTS 3030 or HTS 3031 or HTS 3032 or HTS 3035 or HTS 3036 or HTS 3038 or HTS 3039 or HTS 3041 or HTS 3043 or HTS 3045 or HTS 3051 or HTS 3061 or HTS 3062 or HTS 3063 or HTS 3064 or HTS 3065 or HTS 3069 or HTS 3087 or INTA 1110 or INTA 2030 or INTA 2040 or INTA 2100 or INTA 2210 or INTA 2220 or INTA 2230 or INTA 3010 or INTA 3020 or INTA 3031 or INTA 3101 or INTA 3102 or INTA 3104 or INTA 3120 or INTA 3121 or INTA 3130 or INTA 3131 or INTA 3203 or INTA 3220 or INTA 3221 or INTA 3230 or INTA 3231 or INTA 3240 or INTA 3241 or INTA 3301 or INTA 3303 or INTA 3304 or INTA 3321 or INTA 3330 or INTA 3331 or INTA 4007 or INTA 4011 or INTA 4040 or INTA 4050 or INTA 4060 or INTA 4101 or INTA 4121 or INTA 4230 orINTA 4240 or INTA 4241 or INTA 4330 or INTA 4331 or INTA 4332 or INTA 4333 or INTA 4340
2. Any CoS or CS course.
3. Minimum grade of C required.
4. Any Modern Language 2000-level or higher.
5. Students must complete one 2000-level or higher Ethics course during their program.
6. Other Core D Math Options include:MATH 1551 and MATH 1554, MATH 1551 and MATH 1564, MATH 1550 and MATH 1553, MATH 1550 and MATH 1554, or MATH 1550 and MATH 1564.
7. Classes applied here cannot double count toward any thread requirement.

Bachelor of Science in Literature, Media, and Communication - Thread: Literature & Social Justice

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics [6]	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
International Requirement [1]		3
Any SS		6
Core F - Courses Related to Major		
Technical Electives [2]		6
Ethics Requirement [5]		3
LMC 2000	Introduction to Literature, Media, and Communication	3
Select two of the following: [3,7]		6
LMC 2050	Seminar in Literature, Media, and Communication	
LMC 2060	Introduction to Literary Studies	
LMC 2100	Introduction to Science, Technology and Culture	
LMC 2200	Introduction to Gender Studies	
LMC 2350	Introduction to Social Justice	
LMC 2400	Introduction to Media Studies	
LMC 2450	Introduction to Black Media Studies	
LMC 2500	Introduction to Film	

LMC 2600	Introduction to Performance Studies	
Major Requirements		
Select one of the following: [3]		3
LMC 4000	Senior Seminar in Literature, Media, and Communication	
or LMC 4	Seminar in Film Studies	
or LMC 4	Senior Thesis	
Concentration		
Literature		
LMC 2060	Introduction to Literary Studies	3
Select two Foundations courses: [3]		6
LMC 3202	Studies in Fiction	
LMC 3226	Major Authors	
LMC 3502	Ancient and Medieval Literature and Culture	
LMC 3504	Renaissance Literature and Culture	
LMC 3506	Enlightenment and Culture	
LMC 3511	American Literature & Culture	
LMC 3512	British and Continental Romanticism	
LMC 3514	Victorian Literature and Culture	
LMC 3516	Literary and Cultural Modernism	
LMC 3518	Literary and Cultural Postmodernism	
Select three Specialty courses: [3]		9
LMC 3102	Science, Technology, and the Classical Tradition	
LMC 3112	Evolution and the Industrial Age	
LMC 3204	Poetry and Poetics	
LMC 3208	African American Literature and Culture	
LMC 3210	Ethnicity in American Culture	
LMC 3212	Women, Literature, and Culture	
LMC 3214	Science Fiction	
LMC 3219	Literature and Medicine	
LMC 3228	Shakespeare	
LMC 3234	Creative Writing	
LMC 3236	Writing for the Stage and Screen	
LMC 3316	Science, Technology, and Postcolonialism	
LMC 3520	Contemporary Issues in Literature & Culture	
LMC 3813	Special Topics	
LMC 4204	Poetry and Poetics II	
Social Justice		
LMC 3302	Science, Technology, and Ideology [3]	3
Select two Foundations courses: [3]		6
LMC 2200	Introduction to Gender Studies	
LMC 3208	African American Literature and Culture	
LMC 3210	Ethnicity in American Culture	
LMC 3212	Women, Literature, and Culture	
LMC 3219	Literature and Medicine	
LMC 3225	Gender Studies in the Disciplines	
LMC 3302	Science, Technology, and Ideology	
LMC 3304	Science, Technology, and Gender	
LMC 3306	Science, Technology, and Race	
LMC 3318	Biomedicine and Culture	
Select three Specialty courses [3]		9
LMC 3104	The Age of Scientific Discovery	
LMC 3106	The Age of Scientific Revolution	
LMC 3112	Evolution and the Industrial Age	
LMC 3202	Studies in Fiction	
LMC 3214	Science Fiction	
LMC 3257	Global Cinema	
LMC 3258	Documentary Film	
LMC 3263	Music, Culture, and Society	
LMC 3308	Environmentalism and Ecocriticism	
LMC 3316	Science, Technology, and Postcolonialism	
LMC 3404	Social Media	
LMC 3405	Media, Culture, and Society	
LMC 3511	American Literature & Culture	
LMC 3520	Contemporary Issues in Literature & Culture	
LMC 3813	Special Topics	
LMC Electives [3]		6
Free Electives		
Free Electives		14
Total Credit Hours		**122**

1 Must be selected from the following list: Allow ECON 2101 or ECON 3300 or ECON 4311 or ECON 4350 or ECON 4351 or ECON 4355 or ECON 4411 or ECON 4415 or ECON 4620 or HTS 1031 or HTS 2036 or HTS 2037 or HTS 2041 or HTS 2061 or HTS 2062 or HTS 2082 or HTS 3012 or HTS 3015 or HTS 3028 or HTS 3030 or HTS 3031 or HTS 3032 or HTS 3035 or HTS 3036 or HTS 3038 or HTS 3039 or HTS 3041 or HTS 3043 or HTS 3045 or HTS 3051 or HTS 3061 or HTS 3062 or HTS 3063 or HTS 3064 or HTS 3065 or HTS 3069 or HTS 3087 or INTA 1110 or INTA 2030 or INTA 2040 or INTA 2100 or INTA 2210 or INTA 2220 or INTA 2230 or INTA 3010 or INTA 3020 or INTA 3031 or INTA 3101 or INTA 3102 or INTA 3104 or INTA 3120 or INTA 3121 or INTA 3130 or INTA 3131 or INTA 3203 or INTA 3220 or INTA 3221 or INTA 3230 or INTA 3231 or INTA 3240 or INTA 3241 or INTA 3301 or INTA 3303 or INTA 3304 or INTA 3321 or INTA 3330 or INTA 3331 or INTA 4007 or INTA 4011 or INTA 4040 or INTA 4050 or INTA 4060 or INTA 4101 or INTA 4121 or INTA 4230 orINTA 4240 or INTA 4241 or INTA 4330 or INTA 4331 or INTA 4332 or INTA 4333 or INTA 4340

2 Any CoS or CS course.

3 Minimum grade of C required.

4 Any Modern Language 2000-level or higher.

5 Students must complete one 2000-level or higher Ethics course during their program.

6 Other Core D Math Options include:MATH 1551 and MATH 1554, MATH 1551 and MATH 1564, MATH 1550 and MATH 1553, MATH 1550 and MATH 1554, or MATH 1550 and MATH 1564.

7 Classes applied here cannot double count toward any thread requirements.

Bachelor of Science in Literature, Media, and Communication - Thread: Media & Communication

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics [6]	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
International Requirement [1]		3
Any SS		6
Core F - Courses Related to Major		
Technical Electives [2]		6
Ethics Requirement [5]		3
LMC 2000	Introduction to Literature, Media, and Communication	3
Select two of the following: [3,7]		6
LMC 2050	Seminar in Literature, Media, and Communication [3]	
LMC 2060	Introduction to Literary Studies	
LMC 2100	Introduction to Science, Technology and Culture	
LMC 2200	Introduction to Gender Studies	
LMC 2350	Introduction to Social Justice	
LMC 2400	Introduction to Media Studies	
LMC 2450	Introduction to Black Media Studies	
LMC 2500	Introduction to Film	
LMC 2600	Introduction to Performance Studies	
Major Requirements		
Select one of the following: [3]		3
LMC 4000	Senior Seminar in Literature, Media, and Communication	
or LMC 4	Seminar in Film Studies	
or LMC 4	Senior Thesis	
Concentration		
Communication		
LMC 3403	Technical Communication, Theory and Practice [3]	3
Select two Foundation courses: [3]		6
LMC 2400	Introduction to Media Studies	
LMC 2720	Principles of Visual Design	
LMC 3206	Communication and Culture	
LMC 3310	The Rhetoric of Scientific Inquiry	
LMC 3404	Social Media	
LMC 3405	Media, Culture, and Society	
LMC 3406	Video Production	
LMC 3408	The Rhetoric of Technical Narratives	
LMC 3410	The Rhetoric of Nonlinear Documents	
LMC 3412	Communicating Science and Technology to the Public	
Select three Specialty courses: [3]		9
LMC 3214	Science Fiction	
LMC 3215	Science Fiction Film and Television	
LMC 3225	Gender Studies in the Disciplines	
LMC 3236	Writing for the Stage and Screen	
LMC 3252	Studies in Film and Television	
LMC 3302	Science, Technology, and Ideology	
LMC 3314	Technologies of Representation	
LMC 3318	Biomedicine and Culture	
LMC 3402	Graphic and Visual Design	
LMC 3520	Contemporary Issues in Literature & Culture	
LMC 3705	Principles of Information Design	
LMC 3710	Principles of Interaction Design	
LMC 3813	Special Topics	
LMC 4406	Contemporary Issues in Professional Communication	
LMC 4720	Interactive Narrative	
Media		
LMC 2400	Introduction to Media Studies [3]	3
Select two Foundation courses: [3]		6
LMC 2410	Introduction to Game Studies	
LMC 2500	Introduction to Film	
LMC 2600	Introduction to Performance Studies	
LMC 2700	Introduction to Computational Media	
LMC 2720	Principles of Visual Design	
LMC 2730	Constructing the Moving Image	
LMC 3206	Communication and Culture	
LMC 3314	Technologies of Representation	
LMC 3404	Social Media	
LMC 3405	Media, Culture, and Society	

Select three Specialty courses: [3]		9
LMC 3252	Studies in Film and Television	
LMC 3253	Animation	
LMC 3254	Film History	
LMC 3255	Cinema and Digital Culture	
LMC 3256	Major Filmmakers	
LMC 3257	Global Cinema	
LMC 3258	Documentary Film	
LMC 3259	Experimental Film	
LMC 3263	Music, Culture, and Society	
LMC 3352	Film and/as Technology	
LMC 3402	Graphic and Visual Design	
LMC 3406	Video Production	
LMC 3407	Advanced Video Production	
LMC 3813	Special Topics	
LMC 4730	Experimental Digital Art	
LMC 4733	Mixed Reality Experience Design	
LMC Electives [3]		6
Free Electives		
Free Electives		14
Total Credit Hours		**122**

1 Must be selected from the following list: Allow ECON 2101 or ECON 3300 or ECON 4311 or ECON 4350 or ECON 4351 or ECON 4355 or ECON 4411 or ECON 4415 or ECON 4620 or HTS 1031 or HTS 2036 or HTS 2037 or HTS 2041 or HTS 2061 or HTS 2062 or HTS 2082 or HTS 3012 or HTS 3015 or HTS 3028 or HTS 3030 or HTS 3031 or HTS 3032 or HTS 3035 or HTS 3036 or HTS 3038 or HTS 3039 or HTS 3041 or HTS 3043 or HTS 3045 or HTS 3051 or HTS 3061 or HTS 3062 or HTS 3063 or HTS 3064 or HTS 3065 or HTS 3069 or HTS 3087 or INTA 1110 or INTA 2030 or INTA 2040 or INTA 2100 or INTA 2210 or INTA 2220 or INTA 2230 or INTA 3010 or INTA 3020 or INTA 3031 or INTA 3101 or INTA 3102 or INTA 3104 or INTA 3120 or INTA 3121 or INTA 3130 or INTA 3131 or INTA 3203 or INTA 3220 or INTA 3221 or INTA 3230 or INTA 3231 or INTA 3240 or INTA 3241 or INTA 3301 or INTA 3303 or INTA 3304 or INTA 3321 or INTA 3330 or INTA 3331 or INTA 4007 or INTA 4011 or INTA 4040 or INTA 4050 or INTA 4060 or INTA 4101 or INTA 4121 or INTA 4230 orINTA 4240 or INTA 4241 or INTA 4330 or INTA 4331 or INTA 4332 or INTA 4333 or INTA 4340

2 Any CoS or CS course.

3 Minimum grade of C required.

4 Any Modern Language 2000-level or higher.

5 Students must complete one 2000-level or higher Ethics course during their program.

6 Other Core D Math Options include:MATH 1551 and MATH 1554, MATH 1551 and MATH 1564, MATH 1550 and MATH 1553, MATH 1550 and MATH 1554, or MATH 1550 and MATH 1564.

7 Classes applied here cannot double count toward any thread requirements.

Bachelor of Science in Literature, Media, and Communication - Thread: Media & Design

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics [6]	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
International Requirement [1]		3
Any SS		6
Core F - Courses Related to Major		
Technical Electives [2]		6
Ethics Requirement [5]		3
LMC 2000	Introduction to Literature, Media, and Communication	3
Select two of the following: [3,7]		6
LMC 2050	Seminar in Literature, Media, and Communication [3]	
LMC 2060	Introduction to Literary Studies	
LMC 2100	Introduction to Science, Technology and Culture	
LMC 2200	Introduction to Gender Studies	
LMC 2350	Introduction to Social Justice	
LMC 2400	Introduction to Media Studies	
LMC 2450	Introduction to Black Media Studies	
LMC 2500	Introduction to Film	

LMC 2600	Introduction to Performance Studies	
Major Requirements		
Select one of the following: [3]		3
LMC 4000	Senior Seminar in Literature, Media, and Communication	
or LMC 4	Seminar in Film Studies	
or LMC 4	Senior Thesis	
Concentration		
Media		
LMC 2400	Introduction to Media Studies [3]	3
Select two Foundations courses: [3]		6
LMC 2410	Introduction to Game Studies	
LMC 2500	Introduction to Film	
LMC 2600	Introduction to Performance Studies	
LMC 2700	Introduction to Computational Media [3]	
LMC 2720	Principles of Visual Design [3]	
LMC 2730	Constructing the Moving Image	
LMC 3206	Communication and Culture	
LMC 3314	Technologies of Representation	
LMC 3404	Social Media	
LMC 3405	Media, Culture, and Society	
Select three Specialty courses: [3]		9
LMC 3252	Studies in Film and Television	
LMC 3252	Studies in Film and Television	
LMC 3234	Creative Writing	
LMC 3254	Film History	
LMC 3255	Cinema and Digital Culture	
LMC 3256	Major Filmmakers	
LMC 3257	Global Cinema	
LMC 3258	Documentary Film	
LMC 3259	Experimental Film	
LMC 3352	Film and/as Technology	
LMC 3402	Graphic and Visual Design	
LMC 3406	Video Production	
LMC 4730	Experimental Digital Art	
LMC 3813	Special Topics	
LMC 4733	Mixed Reality Experience Design	
Design		
LMC 2720	Principles of Visual Design [3]	3
Select two Foundations courses: [3]		6
LMC 2400	Introduction to Media Studies	
LMC 2410	Introduction to Game Studies	
LMC 2700	Introduction to Computational Media	
LMC 2730	Constructing the Moving Image	
LMC 3314	Technologies of Representation	
LMC 3402	Graphic and Visual Design	
LMC 3705	Principles of Information Design	
LMC 3710	Principles of Interaction Design	
LMC 4725	Games Design as a Cultural Practice	
LMC 4733	Mixed Reality Experience Design	
Select three Specialty courses: [3]		9
LMC 3106	The Age of Scientific Revolution	
LMC 3206	Communication and Culture	
LMC 3306	Science, Technology, and Race	
LMC 3308	Environmentalism and Ecocriticism	
LMC 3318	Biomedicine and Culture	
LMC 3403	Technical Communication, Theory and Practice	
LMC 3404	Social Media	
LMC 3406	Video Production	
LMC 3407	Advanced Video Production	
LMC 3408	The Rhetoric of Technical Narratives	
LMC 3410	The Rhetoric of Nonlinear Documents	
LMC 3412	Communicating Science and Technology to the Public	
LMC 4720	Interactive Narrative	
LMC 3813	Special Topics	
LMC 4730	Experimental Digital Art	
LMC Electives [3]		6
Free Electives		
Free Electives		14
Total Credit Hours		**122**

1. Must be selected from the following list: Allow ECON 2101 or ECON 3300 or ECON 4311 or ECON 4350 or ECON 4351 or ECON 4355 or ECON 4411 or ECON 4415 or ECON 4620 or HTS 1031 or HTS 2036 or HTS 2037 or HTS 2041 or HTS 2061 or HTS 2062 or HTS 2082 or HTS 3012 or HTS 3015 or HTS 3028 or HTS 3030 or HTS 3031 or HTS 3032 or HTS 3035 or HTS 3036 or HTS 3038 or HTS 3039 or HTS 3041 or HTS 3043 or HTS 3045 or HTS 3051 or HTS 3061 or HTS 3062 or HTS 3063 or HTS 3064 or HTS 3065 or HTS 3069 or HTS 3087 or INTA 1110 or INTA 2030 or INTA 2040 or INTA 2100 or INTA 2210 or INTA 2220 or INTA 2230 or INTA 3010 or INTA 3020 or INTA 3031 or INTA 3101 or INTA 3102 or INTA 3104 or INTA 3120 or INTA 3121 or INTA 3130 or INTA 3131 or INTA 3203 or INTA 3220 or INTA 3221 or INTA 3230 or INTA 3231 or INTA 3240 or INTA 3241 or INTA 3301 or INTA 3303 or INTA 3304 or INTA 3321 or INTA 3330 or INTA 3331 or INTA 4007 or INTA 4011 or INTA 4040 or INTA 4050 or INTA 4060 or INTA 4101 or INTA 4121 or INTA 4230 orINTA 4240 or INTA 4241 or INTA 4330 or INTA 4331 or INTA 4332 or INTA 4333 or INTA 4340
2. Any CoS or CS course.
3. Minimum grade of C required.
4. Any Modern Language 2000-level or higher.
5. Students must complete one 2000-level or higher Ethics course during their program.
6. Other Core D Math Options include:MATH 1551 and MATH 1554, MATH 1551 and MATH 1564, MATH 1550 and MATH 1553, MATH 1550 and MATH 1554, or MATH 1550 and MATH 1564.
7. Classes applied here cannot double count toward thread requirements.

Bachelor of Science in Literature, Media, and Communication - Thread: Media & Science, Technology and Culture

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics [6]	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
International Requirement [1]		3
Any SS		6
Core F - Courses Related to Major		
Technical Electives [2]		6
Ethics Requirement [5]		3
LMC 2000	Introduction to Literature, Media, and Communication	3
Select two of the following: [3,7]		6
LMC 2050	Seminar in Literature, Media, and Communication	
LMC 2060	Introduction to Literary Studies	
LMC 2100	Introduction to Science, Technology and Culture	
LMC 2200	Introduction to Gender Studies	
LMC 2350	Introduction to Social Justice	
LMC 2400	Introduction to Media Studies	
LMC 2450	Introduction to Black Media Studies	
LMC 2500	Introduction to Film	
LMC 2600	Introduction to Performance Studies	
Major Requirements		
Select one of the following: [3]		3
LMC 4000	Senior Seminar in Literature, Media, and Communication	
or LMC 4	Seminar in Film Studies	
or LMC 4	Senior Thesis	
Concentration		
Science, Technology, and Culture		
LMC 2100	Introduction to Science, Technology and Culture [3]	3
Select two Foundations courses: [3]		6
LMC 3104	The Age of Scientific Discovery	
LMC 3106	The Age of Scientific Revolution	
LMC 3112	Evolution and the Industrial Age	
LMC 3214	Science Fiction	
LMC 3215	Science Fiction Film and Television	
LMC 3310	The Rhetoric of Scientific Inquiry	
LMC 3318	Biomedicine and Culture	
LMC 3302	Science, Technology, and Ideology	
LMC 3304	Science, Technology, and Gender	
LMC 3306	Science, Technology, and Race	
Select three Specialty courses: [3]		9
LMC 3206	Communication and Culture	
LMC 3219	Literature and Medicine	
LMC 3225	Gender Studies in the Disciplines	
LMC 3257	Global Cinema	
LMC 3308	Environmentalism and Ecocriticism	
LMC 3314	Technologies of Representation	
LMC 3352	Film and/as Technology	
LMC 3403	Technical Communication, Theory and Practice	
LMC 3404	Social Media	
LMC 3405	Media, Culture, and Society	
LMC 3410	The Rhetoric of Nonlinear Documents	
LMC 3813	Special Topics	
LMC 4725	Games Design as a Cultural Practice	
LMC 4730	Experimental Digital Art	
LMC 4733	Mixed Reality Experience Design	
Media		
LMC 2400	Introduction to Media Studies [3]	3
Select two Foundations courses: [3]		6
LMC 2410	Introduction to Game Studies	
LMC 2500	Introduction to Film	
LMC 2600	Introduction to Performance Studies	
LMC 2700	Introduction to Computational Media	
LMC 2720	Principles of Visual Design	
LMC 2730	Constructing the Moving Image	
LMC 3206	Communication and Culture	
LMC 3314	Technologies of Representation	
LMC 3404	Social Media	
LMC 3405	Media, Culture, and Society	

Select three Specialty courses: [3]		9
LMC 3252	Studies in Film and Television	
LMC 3253	Animation	
LMC 3254	Film History	
LMC 3255	Cinema and Digital Culture	
LMC 3256	Major Filmmakers	
LMC 3257	Global Cinema	
LMC 3258	Documentary Film	
LMC 3259	Experimental Film	
LMC 3263	Music, Culture, and Society	
LMC 3352	Film and/as Technology	
LMC 3402	Graphic and Visual Design	
LMC 3406	Video Production	
LMC 3407	Advanced Video Production	
LMC 4730	Experimental Digital Art	
LMC 3813	Special Topics	
LMC 4733	Mixed Reality Experience Design	
LMC Electives [3]		6
Free Electives		
Free Electives		14
Total Credit Hours		**122**

1 Must be selected from the following list: Allow ECON 2101 or ECON 3300 or ECON 4311 or ECON 4350 or ECON 4351 or ECON 4355 or ECON 4411 or ECON 4415 or ECON 4620 or HTS 1031 or HTS 2036 or HTS 2037 or HTS 2041 or HTS 2061 or HTS 2062 or HTS 2082 or HTS 3012 or HTS 3015 or HTS 3028 or HTS 3030 or HTS 3031 or HTS 3032 or HTS 3035 or HTS 3036 or HTS 3038 or HTS 3039 or HTS 3041 or HTS 3043 or HTS 3045 or HTS 3051 or HTS 3061 or HTS 3062 or HTS 3063 or HTS 3064 or HTS 3065 or HTS 3069 or HTS 3087 or INTA 1110 or INTA 2030 or INTA 2040 or INTA 2100 or INTA 2210 or INTA 2220 or INTA 2230 or INTA 3010 or INTA 3020 or INTA 3031 or INTA 3101 or INTA 3102 or INTA 3104 or INTA 3120 or INTA 3121 or INTA 3130 or INTA 3131 or INTA 3203 or INTA 3220 or INTA 3221 or INTA 3230 or INTA 3231 or INTA 3240 or INTA 3241 or INTA 3301 or INTA 3303 or INTA 3304 or INTA 3321 or INTA 3330 or INTA 3331 or INTA 4007 or INTA 4011 or INTA 4040 or INTA 4050 or INTA 4060 or INTA 4101 or INTA 4121 or INTA 4230 orINTA 4240 or INTA 4241 or INTA 4330 or INTA 4331 or INTA 4332 or INTA 4333 or INTA 4340

2 Any CoS or CS course.

3 Minimum grade of C required.

4 Any Modern Language 2000-level or higher.

5 Students must complete one 2000-level or higher Ethics course during their program.

6 Other Core D Math Options include:MATH 1551 and MATH 1554, MATH 1551 and MATH 1564, MATH 1550 and MATH 1553, MATH 1550 and MATH 1554, or MATH 1550 and MATH 1564.

7 Classes applied here cannot double count toward any thread requirements.

Bachelor of Science in Literature, Media, and Communication - Thread: Media & Social Justice

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics [6]	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
International Requirement [1]		3
Any SS		6
Core F - Courses Related to Major		
Technical Electives [2]		6
Ethics Requirement [5]		3
LMC 2000	Introduction to Literature, Media, and Communication	3
Select two of the following: [3,7]		6
LMC 2050	Seminar in Literature, Media, and Communication [3]	
LMC 2060	Introduction to Literary Studies	
LMC 2100	Introduction to Science, Technology and Culture	
LMC 2200	Introduction to Gender Studies	
LMC 2350	Introduction to Social Justice	
LMC 2400	Introduction to Media Studies	
LMC 2450	Introduction to Black Media Studies	
LMC 2500	Introduction to Film	

LMC 2600	Introduction to Performance Studies	
Major Requirements		
Select one of the following: [3]		3
LMC 4000	Senior Seminar in Literature, Media, and Communication	
or LMC 4	Seminar in Film Studies	
or LMC 4	Senior Thesis	
Concentration		
Media		
LMC 2400	Introduction to Media Studies [3]	3
Select two Foundations courses: [3]		6
LMC 2410	Introduction to Game Studies	
LMC 2500	Introduction to Film	
LMC 2600	Introduction to Performance Studies	
LMC 2700	Introduction to Computational Media	
LMC 2720	Principles of Visual Design	
LMC 2730	Constructing the Moving Image	
LMC 3206	Communication and Culture	
LMC 3314	Technologies of Representation	
LMC 3404	Social Media	
LMC 3405	Media, Culture, and Society	
Select three Specialty courses: [3]		9
LMC 3252	Studies in Film and Television	
LMC 3253	Animation	
LMC 3254	Film History	
LMC 3255	Cinema and Digital Culture	
LMC 3256	Major Filmmakers	
LMC 3257	Global Cinema	
LMC 3258	Documentary Film	
LMC 3259	Experimental Film	
LMC 3263	Music, Culture, and Society	
LMC 3352	Film and/as Technology	
LMC 3402	Graphic and Visual Design	
LMC 3406	Video Production	
LMC 3407	Advanced Video Production	
LMC 3813	Special Topics	
LMC 4730	Experimental Digital Art	
LMC 4733	Mixed Reality Experience Design	
Social Justice		
LMC 3302	Science, Technology, and Ideology	3
Select two Foundations courses: [3]		6
LMC 2200	Introduction to Gender Studies	
LMC 3208	African American Literature and Culture	
LMC 3210	Ethnicity in American Culture	
LMC 3212	Women, Literature, and Culture	
LMC 3219	Literature and Medicine	
LMC 3225	Gender Studies in the Disciplines	
LMC 3302	Science, Technology, and Ideology	
LMC 3304	Science, Technology, and Gender	
LMC 3306	Science, Technology, and Race	
LMC 3318	Biomedicine and Culture	
Select three Specialty courses: [3]		9
LMC 3104	The Age of Scientific Discovery	
LMC 3106	The Age of Scientific Revolution	
LMC 3112	Evolution and the Industrial Age	
LMC 3202	Studies in Fiction	
LMC 3214	Science Fiction	
LMC 3257	Global Cinema	
LMC 3258	Documentary Film	
LMC 3263	Music, Culture, and Society	
LMC 3308	Environmentalism and Ecocriticism	
LMC 3316	Science, Technology, and Postcolonialism	
LMC 3404	Social Media	
LMC 3405	Media, Culture, and Society	
LMC 3511	American Literature & Culture	
LMC 3520	Contemporary Issues in Literature & Culture	
LMC 3813	Special Topics	
LMC Electives [3]		6
Free Electives		
Free Electives		14
Total Credit Hours		**122**

1 Must be selected from the following list: Allow ECON 2101 or ECON 3300 or ECON 4311 or ECON 4350 or ECON 4351 or ECON 4355 or ECON 4411 or ECON 4415 or ECON 4620 or HTS 1031 or HTS 2036 or HTS 2037 or HTS 2041 or HTS 2061 or HTS 2062 or HTS 2082 or HTS 3012 or HTS 3015 or HTS 3028 or HTS 3030 or HTS 3031 or HTS 3032 or HTS 3035 or HTS 3036 or HTS 3038 or HTS 3039 or HTS 3041 or HTS 3043 or HTS 3045 or HTS 3051 or HTS 3061 or HTS 3062 or HTS 3063 or HTS 3064 or HTS 3065 or HTS 3069 or HTS 3087 or INTA 1110 or INTA 2030 or INTA 2040 or INTA 2100 or INTA 2210 or INTA 2220 or INTA 2230 or INTA 3010 or INTA 3020 or INTA 3031 or INTA 3101 or INTA 3102 or INTA 3104 or INTA 3120 or INTA 3121 or INTA 3130 or INTA 3131 or INTA 3203 or INTA 3220 or INTA 3221 or INTA 3230 or INTA 3231 or INTA 3240 or INTA 3241 or INTA 3301 or INTA 3303 or INTA 3304 or INTA 3321 or INTA 3330 or INTA 3331 or INTA 4007 or INTA 4011 or INTA 4040 or INTA 4050 or INTA 4060 or INTA 4101 or INTA 4121 or INTA 4230 orINTA 4240 or INTA 4241 or INTA 4330 or INTA 4331 or INTA 4332 or INTA 4333 or INTA 4340

2 Any CoS or CS course.

3 Minimum grade of C required.

4 Any Modern Language 2000-level or higher.

5 Students must complete one 2000-level or higher Ethics course during their program.

6 Other Core D Math Options include:MATH 1551 and MATH 1554, MATH 1551 and MATH 1564, MATH 1550 and MATH 1553, MATH 1550 and MATH 1554, or MATH 1550 and MATH 1564.

7 Classes applied here cannot double count toward any thread requirements.

Bachelor of Science in Literature, Media, and Communication - Thread: Social Justice and Science, Technology, and Culture

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics [6]	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
International Requirement [1]		3
Any SS		6
Core F - Courses Related to Major		
Technical Electives [2]		6
Ethics Requirement [5]		3
LMC 2000	Introduction to Literature, Media, and Communication	3
Select two of the following: [3,7]		6
LMC 2050	Seminar in Literature, Media, and Communication	
LMC 2060	Introduction to Literary Studies	
LMC 2100	Introduction to Science, Technology and Culture	
LMC 2200	Introduction to Gender Studies	
LMC 2350	Introduction to Social Justice	
LMC 2400	Introduction to Media Studies	
LMC 2500	Introduction to Film	
LMC 2600	Introduction to Performance Studies	
Major Requirements		
Select one of the following: [3]		3
LMC 4000	Senior Seminar in Literature, Media, and Communication	
or LMC 4500	Seminar in Film Studies	
or LMC 4102	Senior Thesis	
LMC 4500	Seminar in Film Studies	
LMC 4102	Senior Thesis	
Concentration		
Science, Technology, and Culture		
LMC 2100	Introduction to Science, Technology and Culture [3]	3
Select two Foundations courses: [3]		6
LMC 3104	The Age of Scientific Discovery	
LMC 3106	The Age of Scientific Revolution	
LMC 3112	Evolution and the Industrial Age	
LMC 3214	Science Fiction	
LMC 3215	Science Fiction Film and Television	
LMC 3310	The Rhetoric of Scientific Inquiry	
LMC 3318	Biomedicine and Culture	
LMC 3302	Science, Technology, and Ideology	
LMC 3304	Science, Technology, and Gender	
LMC 3306	Science, Technology, and Race	
Select three Specialty courses: [3]		9
LMC 3206	Communication and Culture	
LMC 3219	Literature and Medicine	
LMC 3225	Gender Studies in the Disciplines	
LMC 3257	Global Cinema	
LMC 3308	Environmentalism and Ecocriticism	
LMC 3314	Technologies of Representation	
LMC 3352	Film and/as Technology	
LMC 3403	Technical Communication, Theory and Practice	
LMC 3404	Social Media	
LMC 3405	Media, Culture, and Society	
LMC 3411	The Rhetoric of Visual Communication	
LMC 3813	Special Topics	
LMC 4725	Games Design as a Cultural Practice	
LMC 4730	Experimental Digital Art	
LMC 4733	Mixed Reality Experience Design	
Social Justice		
LMC 2350	Introduction to Social Justice	3
Select two Foundations courses: [3]		6
LMC 2200	Introduction to Gender Studies	
LMC 3208	African American Literature and Culture	
LMC 3210	Ethnicity in American Culture	
LMC 3212	Women, Literature, and Culture	
LMC 3219	Literature and Medicine	
LMC 3225	Gender Studies in the Disciplines	
LMC 3302	Science, Technology, and Ideology	
LMC 3304	Science, Technology, and Gender	
LMC 3306	Science, Technology, and Race	

LMC 3318	Biomedicine and Culture	
Select three Specialty courses: [3]		9
LMC 3104	The Age of Scientific Discovery	
LMC 3106	The Age of Scientific Revolution	
LMC 3112	Evolution and the Industrial Age	
LMC 3202	Studies in Fiction	
LMC 3214	Science Fiction	
LMC 3257	Global Cinema	
LMC 3258	Documentary Film	
LMC 3263	Music, Culture, and Society	
LMC 3308	Environmentalism and Ecocriticism	
LMC 3316	Science, Technology, and Postcolonialism	
LMC 3404	Social Media	
LMC 3405	Media, Culture, and Society	
LMC 3511	American Literature & Culture	
LMC 3520	Contemporary Issues in Literature & Culture	
LMC 3813	Special Topics	
LMC Electives [3]		6
Free Electives		
Free Electives		14
Total Credit Hours		**122**

[1] Must be selected from the following list: Allow ECON 2101 or ECON 3300 or ECON 4311 or ECON 4350 or ECON 4351 or ECON 4355 or ECON 4411 or ECON 4415 or ECON 4620 or HTS 1031 or HTS 2036 or HTS 2037 or HTS 2041 or HTS 2061 or HTS 2062 or HTS 2082 or HTS 3012 or HTS 3015 or HTS 3028 or HTS 3030 or HTS 3031 or HTS 3032 or HTS 3035 or HTS 3036 or HTS 3038 or HTS 3039 or HTS 3041 or HTS 3043 or HTS 3045 or HTS 3051 or HTS 3061 or HTS 3062 or HTS 3063 or HTS 3064 or HTS 3065 or HTS 3069 or HTS 3087 or INTA 1110 or INTA 2030 or INTA 2040 or INTA 2100 or INTA 2210 or INTA 2220 or INTA 2230 or INTA 3010 or INTA 3020 or INTA 3031 or INTA 3101 or INTA 3102 or INTA 3104 or INTA 3120 or INTA 3121 or INTA 3130 or INTA 3131 or INTA 3203 or INTA 3220 or INTA 3221 or INTA 3230 or INTA 3231 or INTA 3240 or INTA 3241 or INTA 3301 or INTA 3303 or INTA 3304 or INTA 3321 or INTA 3330 or INTA 3331 or INTA 4007 or INTA 4011 or INTA 4040 or INTA 4050 or INTA 4060 or INTA 4101 or INTA 4121 or INTA 4230 orINTA 4240 or INTA 4241 or INTA 4330 or INTA 4331 or INTA 4332 or INTA 4333 or INTA 4340

[2] Any CoS or CS course.

[3] Minimum grade of C required.

[4] Any Modern Language 2000-level or higher.

[5] Students must complete one 2000-level or higher Ethics course during their program. For a complete list of Ethics courses, please see: /academics/undergraduate/core-curriculum/ethics/

[6] Other Core D Math Options include:MATH 1551 and MATH 1554, MATH 1551 and MATH 1564, MATH 1550 and MATH 1553, MATH 1550 and MATH 1554, or MATH 1550 and MATH 1564.

[7] Classes applied here cannot double count toward any degree requirements.

BACHELOR OF SCIENCE IN MATERIALS SCIENCE AND ENGINEERING

The materials science and engineering undergraduate program offers a BS degree in Materials Science and Engineering with concentrations in Polymer and Fiber materials, Structural and Functional materials and Biomaterials. This versatile degree combines instruction in the fundamentals of ceramic, metallurgy, and polymer and fiber science and engineering with specialized knowledge and skills, including nano-, bio-, composite, electronic, and optical and magnetic materials. Freshmen and sophomores study basic chemistry, physics, mathematics, and engineering science and are introduced to the fundamental aspects of materials. Two English courses taken in the freshman year provide the foundation for further instruction in communications that is integrated throughout the curriculum. Juniors and seniors take courses in the engineering and science of materials including the details of materials processing, structure, and properties. The curriculum culminates in a two-course senior design sequence in which students work in teams to design a material, component, or process using previously learned skills and knowledge.

Five concentration related courses provide flexibility that allow students in their junior-senior years to focus in a particular area of materials. Five hours of free electives allows students to further specialize or pursue other interests. Courses in the humanities/fine arts and social sciences ensure that graduates appreciate the role of engineering in today's global society.

Mission Statement

The mission of the Bachelor of Science in Materials Science and Engineering program is to produce graduates well-rounded in the fundamentals of materials science and engineering who are prepared to meet the related needs of industry and government, and prepared for advanced academic study in materials related disciplines. This will be accomplished by providing students with up-to-date knowledge and skills through coursework, modern laboratories, opportunities to conduct cutting edge research with distinguished faculty mentors, and opportunities to participate in leadership and service activities.

Program Educational Objectives

The Program Educational Objectives of the Bachelor of Science in Materials Science and Engineering program are:

- Our graduates will rapidly rise to leadership roles in materials-related positions in industry, academia, government, and other career pursuits.
- Our graduates will be global leaders, collaborating with diverse, multi-disciplinary teams while incorporating emerging materials developments and engineering technologies that are positively changing society and the human condition.
- Our graduates will continue to grow their cumulative knowledge base by engaging in life-long learning via career-appropriate options, including post-graduate education and professional designations.
- Our graduates will be entrepreneurs, continually discovering, designing and creating new materials of all types, building on the process-structure-properties-performance paradigm to exert positive economic and social impacts across the field and society.

Grade Requirements

In order to encourage students to explore subjects of personal or professional interest without jeopardizing their GPA, the Institute has a limited pass/fail option. The policy of the School of Materials Science and Engineering regarding the use of pass/fail hours for credit is as follows: no course specifically required by name and number by the materials science and engineering curriculum may be taken on a pass/fail basis and used toward graduation, unless the course is offered only on that basis.

In cases of deficiencies obtained for the intended graduation term, refer to Section VII (on Deficiencies) of the Rules and Regulations published in the on-line General Catalog.

Transfer Students

Students transferring into Materials Science and Engineering from another university or major should meet with the Associate Chair for Undergraduate Programs to discuss possible course substitutions and plan their remaining coursework.

- Bachelor of Science in Materials Science and Engineering - Biomaterials
- Bachelor of Science in Materials Science and Engineering - Polymer and Fiber Materials
- Bachelor of Science in Materials Science and Engineering - Structural Materials
- Bachelor of Science in Materials Science and Engineering - Functional Materials

Cooperative Plan

Since 1912, Georgia Tech has offered a five-year Undergraduate Cooperative Program to those students who wish to combine career-related work experience with classroom studies. The program is the fourth oldest of its kind in the world.

Students typically alternate between industrial assignments and classroom studies until they complete at least three terms of work (two of which must be fall or spring). Co-op students complete the same coursework on campus that is completed by non-co-op students. Most co-op students begin the program as freshman or sophomores and are can be classified as full-time students regardless whether they are attending classes on campus or are full-time at an employer's location.

Participants have the opportunity to develop career interests, gain hands-on work experience, develop human relation skills and earn a paycheck. Graduates of the program receive a bachelor's degree with the Cooperative Plan Designation.

Students can also complete work assignments in a foreign country as part of the International Cooperative Program. This program is a great opportunity to utilize foreign language skills, gain a global perspective, and experience a diverse culture. Proficiency in a foreign language is necessary to earn the International Cooperative Plan degree designation. For more information on the Cooperative Program, visit: http://career.gatech.edu/co-op.

We highly recommend careful planning with your faculty research mentor and academic advisor to determine how to incorporate this option into your educational experience.

Internships

The Undergraduate Professional Internship Program is for students who do not participate in the Cooperative Program, but want some career-related work experience before graduation. Students generally work for one semester, usually in the summer, with an option for more work. Students must have completed at least thirty hours of coursework at Georgia Tech before they can participate in the program. For more details, visit: http://career.gatech.edu/internships.

In addition, there is a Work Abroad Program (www.workabroad.gatech.edu), which complements a student's formal education with paid international work experience directly related to Materials Science and Engineering. Participating students typically include juniors and seniors. The international work assignments are designed to include practical training, cross-cultural exposure and learning, and the acquisition of professional skills.

For more information about all of the programs in the Center for Career Discovery and Development, visit www.careerdiscovery.gatech.edu.

We highly recommend careful planning with your faculty research mentor and academic advisor to determine how to incorporate this option into your educational experience.

Research Option

The Materials Science and Engineering undergraduate program offers a Research Option that allows students to participate in undergraduate research in faculty laboratories. The words **"Research Option in Materials Science and Engineering"** will appear on the transcript of each student completing the requirements to indicate that the student has had a substantial, in-depth, research experience.

The requirements for the **"Research Option"** in Materials Science and Engineering are:

1. Selection of a faculty advisor and research topic in conjunction with the faculty advisor. The topic and expected scope of the project must be approved in advance by the MSE Undergraduate Curriculum Committee. A key criterion will be whether the research may lead to a publishable paper.
2. Completion of nine units (see item 3 below) of supervised research, over a period of at least two, but preferably three, terms. Research may be either for pay or credit. At least six credit hours must involve work on a single research project.
3. Registration in nine hours of undergraduate research courses MSE 2698 and MSE 4698 (for pay), or MSE 2699 and MSE 4699 (for credit). MSE 2699 or MSE 4699 can be used to satisfy the free elective requirements of the BS degree in MSE.
4. Completion of LMC 4701 Undergraduate Research Proposal Writing (one hr. credit typically taken during the first or second semester of research). The student should write a Research Proposal while taking this class.
5. Obtain approval of the Research Proposal from the MSE Undergraduate Curriculum Committee. This is required before taking LMC 4702.
6. Completion of LMC 4702 (one hr. credit). This course is taken during the term in which the thesis is written.
7. Have research thesis approved by the faculty advisor and one other MSE faculty member approved by the MSE Undergraduate Curriculum Committee. The thesis will be evaluated on the basis of publishability, originality, creativity, and clarity. The MSE Undergraduate Curriculum Committee must approve each "Research Option" awarded under the BS MSE program.

We highly recommend careful planning with your faculty research mentor and academic advisor to determine how to incorporate this option into your educational experience.

BS/MS Option

The School of Materials Science and Engineering (MSE) offers a BS/MS program for outstanding students who want to obtain a graduate degree in addition to their BS degree. The advanced degree provides the additional knowledge and specialization needed to further facilitate a technical career. As a participant in this program, students have an opportunity to work with individual faculty members on projects in one of the traditional or innovative research areas in MSE. See www.mse.gatech.edu for more details.

Current undergraduate students may participate in the BS/MS Program offered by the School. Georgia Tech undergraduate students may be admitted into the program after completing a minimum of 30 semester credit hours (and no more than 75 hours) at Georgia Tech and have a GPA of 3.5 or higher at time of application. Both the application fee and the GRE test score are waived. Students need to maintain at least a 3.0 GPA when receiving the B.S. degree in order to be converted into graduate student status and must continue immediately into the M.S. program in order to qualify for the 6 semester-hour "Graduate Course Credit" option, http://catalog.gatech.edu/academics/undergraduate/credit-tests-scores/undergraduate-students-taking-graduate-courses/.

Bachelor of Science in Materials Science and Engineering - Biomaterials

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1371	Computing for Engineers	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [1]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
Core E - Social Sciences		

Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
CHEM 1211K	Chemical Principles I	4
CHEM 1212K	Chemical Principles II	4
CHEM 1315	Survey of Organic Chemistry for Engineers	3
MATH 2551	Multivariable Calculus	4
MATH 2552	Differential Equations	4
Ethics [3]		
Major Requirements		
MSE 1111	Introduction to Materials Science and Engineering	1
MSE 2001	Principles and Applications of Engineering Materials	3
MSE 2021	Materials Characterization	4
MSE 3001	Chemical Thermodynamics of Materials	3
MSE 3002	Structural Transformations in Metallic, Ceramic, and Polymeric Systems	3
MSE 3005	Mechanical Behavior of Materials	3
MSE 3015	Electrical, Optical, and Magnetic Properties	3
MSE 3021	Materials Laboratory I	2
MSE 3025	Statistics and Numerical Methods in Materials Science and Engineering	3
MSE 3210	Transport Phenomena	3
MSE 4022	Materials Laboratory II	2
MSE 4410	Capstone Engineering Design I	3
MSE 4420	Capstone Engineering Design II	3
or ME 4723	Interdisciplinary Capstone Design	
MSE 4775	Polymer Science and Engineering I: Formation and Properties	3
Other Requirements		
COE 2001	Statics	2
COE 3001	Mechanics of Deformable Bodies	3
ECE 3710	Circuits and Electronics	2
ECE 3741	Instrumentation and Electronics Lab	1
ISYE 3025	Essentials of Engineering Economy	1
Biomaterials Concentration		
BIOS 1107 & 1107L	Biological Principles and Biological Principles Laboratory	4
MSE 4751	Introduction to Biomaterials	3
Select one of the following:		3
MSE 4330	Fundamentals of Nanomaterials and Nanostructures	
MSE 4335	Soft Nano and Bio Materials	
MSE 4740	Biologically Inspired Design	
CHEM 3511	Survey of Biochemistry	
Biomaterials Elective Course [4,5]		3
Free Electives		
Free Electives [6]		4
Total Credit Hours		**129**

Pass-fail only allowed for Free Electives, Humanities, and Social Sciences.

1 If PHYS 2231 is taken, extra hour goes to Free Electives.
2 If PHYS 2232 is taken, extra hour goes to Free Electives.
3 Any Georgia Tech course that has the Ethics Attribute. Check here for a list of Ethics courses.
4 For students wishing to gain more knowledge in Biomaterials, one of the following courses are recommended: MSE 4330, MSE 4335, MSE 4740, CHEM 3511.
5 Students may meet this requirement by taking ME 1670; Any MSE course except MSE 3720, MSE 3300, MSE 2698, MSE 2699, MSE 4698, MSE 4699. If a student completes the Research Option, they can use the combination of LMC 4701, LMC 4702 and MSE 2699/MSE 4699.
6 MATH 1113 and PHYS 2XXX(AP credit) are not allowed.

Bachelor of Science in Materials and Science Engineering - Structural

Bachelor of Science in Materials and Science Engineering - Materials

Bachelor of Science in Materials Science and Engineering - Polymer and Fiber Materials

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1371	Computing for Engineers	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [1]	4
PHYS 2212	Introductory Physics II [2]	4
MATH 1551	Differential Calculus	2

MATH 1553	Introduction to Linear Algebra	2
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
CHEM 1211K	Chemical Principles I	4
CHEM 1212K	Chemical Principles II	4
CHEM 1315	Survey of Organic Chemistry for Engineers	3
MATH 2551	Multivariable Calculus	4
MATH 2552	Differential Equations	4
Ethics [3]		
Major Requirements		
MSE 1111	Introduction to Materials Science and Engineering	1
MSE 2001	Principles and Applications of Engineering Materials	3
MSE 2021	Materials Characterization	4
MSE 3001	Chemical Thermodynamics of Materials	3
MSE 3002	Structural Transformations in Metallic, Ceramic, and Polymeric Systems	3
MSE 3005	Mechanical Behavior of Materials	3
MSE 3015	Electrical, Optical, and Magnetic Properties	3
MSE 3021	Materials Laboratory I	2
MSE 3025	Statistics and Numerical Methods in Materials Science and Engineering	3
MSE 3210	Transport Phenomena	3
MSE 4022	Materials Laboratory II	2
MSE 4410	Capstone Engineering Design I	3
MSE 4420	Capstone Engineering Design II	3
or MSE 4723	Interdisciplinary Capstone Design	
MSE 4775	Polymer Science and Engineering I: Formation and Properties	3
Other Requirements		
COE 2001	Statics	2
COE 3001	Mechanics of Deformable Bodies	3
ECE 3710	Circuits and Electronics	2
ECE 3741	Instrumentation and Electronics Lab	1
ISYE 3025	Essentials of Engineering Economy	1
Polymer & Fiber Materials Concentration		
MSE 3225	Rheology	3
MSE 3230	Polymer and Fiber Processing	3
MSE 4140	Polymer Physics	3
Polymer and Fiber Materials Electives [4,5]		3
Free Electives		
Free Electives [6]		5
Total Credit Hours		**129**

Pass-fail only allowed for Free Electives, Humanities, and Social Sciences.

1 If PHYS 2231 is taken, extra hour goes to Free Electives.
2 If PHYS 2232 is taken, extra hour goes to Free Electives.
3 Any Georgia Tech courses that has the Ethics attribute. Click here for a list of Ethics courses.
4 For students wishing to gain more knowledge in Polymer and Fiber Materials, one of the following courses are recommended: MSE 4776, MSE 4025, MSE 3220, MSE 4230.
5 Students may meet this requirement by taking ME 1670; any MSE courses except MSE 3720, MSE 3300, MSE 2698, MSE 2699, MSE 4698, MSE 4699. If a student completes the Research Option, they can use the combination of LMC 4701, LMC 4702, and MSE 2699/MSE 4699.
6 MATH 1113 and PHYS 2XXX (AP credit) are not allowed.

BACHELOR OF SCIENCE IN MATHEMATICS

The School of Mathematics at Georgia Tech offers a Bachelor of Science degree in Mathematics. The B.S. in Mathematics degree provides a certification of extensive training in mathematics at one of the nation's leading scientific and technological universities. Holders of this degree are well qualified for a variety of careers in academia, business and industry, computer programming, data science, and education.

The program provides excellent preparation for graduate studies in mathematics and related fields.

Students have the option of completing the B.S. in Mathematics or completing the B.S. in Mathematics with one of the areas of concentration.

Optional concentrations

- Applied Mathematics
- Discrete Mathematics
- Mathematical Foundations in Data Science
- Probability and Statistics
- Pure Mathematics

Bachelor of Science in Mathematics with a concentration in Applied Mathematics

Bachelor of Science in Mathematics with a concentration is Discrete Mathematics

Bachelor of Science in Mathematics with a concentration in Mathematical Foundations in Data Science

Bachelor of Science in Mathematics with a concentration in Pure Mathematics

Bachelor of Science in Mathematics with a concentration in Probability and Statistics

Bachelor of Science in Mathematics - Business Option

Bachelor of Science in Mathematics - General

Business and Research Options

A student may elect to complete both the Business Option and the Research Option.

Completion of the Business and Research Options is noted by the designations "Business Option" and "Research Option" on the student's transcript.

See Concentrations for the for the Business Option requirements. See below for the Research Option requirements.

Math Undergraduate Website

Research Option

Code	Title	Credit Hours
Select one of the following Research Options: [1]		9
MATH 2698 & MATH 46	Undergraduate Research Assistantship and Undergraduate Research Assistantship (for pay)	
MATH 2699 & MATH 469	Undergraduate Research and Undergraduate Research (for credit) [2]	
LMC 4701	Undergraduate Research Proposal Writing (complete during the first or second semester of research) [3]	1
LMC 4702	Undergraduate Research Thesis Writing (take during the thesis-writing semester) [4]	1
Total Credit Hours		**11**

[1] supervised research with a faculty advisor over two or three semesters
[2] Six credit hours of MATH 4699 may be used as mathematics electives for the BS in Mathematics.
[3] a short proposal on the research project is developed
[4] prepare a research report (research paper, project report/thesis), and make an oral presentation of the project

Completion of this Research Option is noted by the designation "Research Option in Mathematics" on the student's transcript.

For more information, visit: http://www.undergradresearch.gatech.edu/research-option/.

College of Sciences B.S. in Mathematics + M.S. Degree Program in Mathematics

The Georgia Tech College of Sciences BS/MS degree program enables highly motivated students with strong academic credentials to earn a Bachelor of Science in Mathematics and a Master of Science in Mathematics. The BS/MS program prepares students for competitive career placements with higher earning potentials as well as competitive admission to Ph.D. and professional programs (including medical/law/pharmacy/dental/pharmacy schools). Thesis and non-thesis options are offered for the BS/MS program. Undergraduates with a significant amount of AP/IB/dual enrollment credits are highly encouraged to apply to the BS/MS program.

Admission and Program Requirements:

1. To apply to the program, students must have at least 30 credit hours earned at Georgia Tech with an undergraduate GPA of 3.3 or higher, and fewer than 90 credit hours overall (including transfer credit).

2. If admitted to the B.S./M.S. program, students must complete six credit hours of MATH coursework, with grades of B or higher, that can be used to fulfil the BS and MS requirements, except seminar, reading or research coursework. This coursework must be completed prior to earning the B.S. degree and proceeding to the M.S. program. These credits will be counted towards both the BS degree and MS degree. Due to the flexibility in selection of courses that may count for the BS and MS degree, MATH academic advisors will communicate with the Degree Certification Team in the Registrar's Office regarding which specific courses (i.e. six credits) are double counted for the BS and MS. This step will assure that degree audits are completed correctly

3. Students considering the M.S. Thesis Option are strongly encouraged to begin undergraduate research early in their B.S. program of study. The student must identify the M.S. thesis advisor prior to completion of the B,S, degree and proceeding to the M.S. program. Research described in an undergraduate thesis submitted as a part of the B.S. Research Option cannot be used in the M.S. thesis.

4. The minimum GPA for graduation with a B.S. in Mathematics to continue to the M.S. program is 3.00. The minimum GPA for graduation with the M.S. is 2.70.

5. The requirements for the BS can be found in https://catalog.gatech.edu/programs/mathematics-bs/ The requirements for the MS can be found in https://catalog.gatech.edu/programs/mathematics-ms/#requirementstext Both requirements are to be fulfilled by the end of the studies to be awarded the BS and MS.

Summary:

Students pursuing the BS/MS Option in Mathematics must complete all requirements for the Bachelor of Science in Mathematics program and the Master of Science in Mathematics program. Students may use a maximum of 6 credit hours of approved coursework (4000-level or higher; not seminar or research credit, MATH 6701 or MATH 6702) in Mathematics with grades of B or higher from the Bachelor of Science program of study.

Bachelor of Science in Mathematics - Business Option

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [1]	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus	2
or MATH 15	Introduction to Differential Calculus	
MATH 1553	Introduction to Linear Algebra	2
or MATH 155	Linear Algebra	
or MATH 156	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
ECON 2106	Principles of Microeconomics	3
Any SS		6
Core F - Courses Related to Major		
CS 1331	Introduction to Object Oriented Programming	3
Lab Science		4
MATH 2551	Multivariable Calculus	4
or MATH 25	Honors Multivariable Calculus	
MATH 2552	Differential Equations	4
or MATH 255	Honors Differential Equations	
MATH 2106	Foundations of Mathematical Proof	3
Bridging Courses		
MATH 3012	Applied Combinatorics	3
MATH 3235	Probability Theory	3
MATH 3406	A Second Course in Linear Algebra	3
Upper Level Foundation Courses		
MATH 4107	Introduction to Abstract Algebra I [2]	3
MATH 4317	Analysis I [2]	3
MATH 4320	Complex Analysis [2]	3
General Mathematics [7]		**21**
Select twelve credits:		
MATH 3236	Statistical Theory	
MATH 4022	Introduction to Graph Theory	
MATH 4032	Combinatorial Analysis	
MATH 4108	Introduction to Abstract Algebra II	
MATH 4150	Introduction to Number Theory	
MATH 4221	Stochastic Processes I	
MATH 4261	Mathematical Statistics I	
MATH 4318	Analysis II	
MATH 4347	Partial Differential Equations I	
MATH 4431	Introductory Topology	
MATH 4432	Introduction to Algebraic Topology	
MATH 4441	Differential Geometry	
MATH 4541	Dynamics and Bifurcations I	
MATH 4640	Numerical Analysis I	
Select nine credits (or, select nine credits from previous list):		
MATH 4012	Algebraic Structures in Coding Theory	
MATH 4080 & MATH 409	Senior Project I and Senior Project II	
MATH 4222	Stochastic Processes II	
MATH 4255	Monte Carlo Methods	
MATH 4262	Mathematical Statistics II	
MATH 4280	Introduction to Information Theory	
MATH 4348	Partial Differential Equations II	
MATH 4542	Dynamics and Bifurcations II	
MATH 4580	Linear Programming	
MATH 4581	Classical Mathematical Methods in Engineering	
MATH 4641	Numerical Analysis II	
MATH 4699	Undergraduate Research [3]	

MATH 4755	Mathematical Biology	
MATH 4777	Vector and Parallel Scientific Computation	
MATH 4782	Quantum Information and Quantum Computing	
MATH 4801	Special Topics	
MATH 4802	Special Topics	
CS 3510	Design and Analysis of Algorithms	
or CS 3511	Design and Analysis of Algorithms, Honors	
CS 4510	Automata and Complexity Theory	
CS 4540	Advanced Algorithms	
CS 4641	Machine Learning	
CX 4140	Computational Modeling Algorithms	
CS 4530	Randomized Algorithms	
CS 4240	Compilers, Interpreters, and Program Analyzers	
ECON 3161	Econometric Analysis	
ECON 4180	Game Theory I	
ISYE 4031	Regression and Forecasting	
ISYE 3133	Engineering Optimization	
ISYE 4133	Advanced Optimization	
Engineering or Science Electives [7]		
BIOS, CHEM, EAS, PHYS, PSYC, ECON, CS, AE, BMED, CEE, CHBE, ECE, ISYE, MSE, ME 3000-level or higher courses [4,5]		3
Business Option		
ACCT 2101	Accounting I: Financial Accounting	3
or MGT 3000	Financial and Managerial Accounting	
PSYC 2220	Industrial/Organizational Psychology	3
or MGT 3100	Organizational Behavior	
or MGT 3150	Principles of Management	
Select 6 credit hours:		6
MGT 3062	Financial Management	
MGT 3078	Finance and Investments	
MGT 3300	Marketing Management I	
MGT 3660	International Business	
MGT 4015	Advanced Managerial Accounting	
MGT 4026	Financial Reporting and Analysis I	
MGT 4028	Financial Analysis and Reporting of Technology Firms	
MGT 4030	International Accounting	
MGT 4190	Strategic Quality Management and Competitiveness	
MGT 4191	The Entrepreneurship Forum	
MGT 4192	Impact Speaker Series Forum	
MGT 4193	Servant Leadership, Values & Systems	
MGT 4194	Social Enterprise and Entrepreneurship	
MGT 4303	Personal Selling and Sales Management	
MGT 4304	Strategic Brand Management	
MGT 4307	Strategic Marketing	
MGT 4335	International Marketing	
MGT 4610	Law, Management, and Economics	
MGT 4670	Entrepreneurship	
Free Electives		
Free Electives [6]		5
Total Credit Hours		**122**

Pass-fail only allowed for Free Electives.

Four courses from Group A list must be completed. Student may select MATH elective from Group B if four courses from Group A are complete, otherwise, the Math elective must come from Group A. If student does not complete four courses from Group A list from concentration requirements and MATH elective, then the course(s) must be completed for free electives.

Group A list: MATH 3236, MATH 4022, MATH 4032, MATH 4108, MATH 4150, MATH 4221, MATH 4261, MATH 4318, MATH 4347, MATH 4431, MATH 4432, MATH 4441, MATH 4541, MATH 4640.

Group B list: MATH 4012, MATH 4080/MATH 4090, MATH 4222, MATH 4255, MATH 4262, MATH 4280, MATH 4348, MATH 4542, MATH 4580, MATH 4581, MATH 4641, MATH 4699, MATH 4755, MATH 4777, MATH 4782, MATH 4801, MATH 4802, CS 3510/CS 3511, CS 4510, CS 4540, CS 4530, CS 4641, CX 4140, CX 4240, ECON 3161, ECON 4180,ISYE 4031, ISYE 3133, ISYE 4133.

1 If PHYS 2231 is taken, extra hour goes toward Free Electives
2 C-minimum required
3 MATH 4699 must be an approved topic and can be used up to 6 hours.
4 CEE 3770,ISYE 3770, CS 4001, and CS 4002 are not allowed to be used here.
5 Two courses must be from the same school.
6 MATH 1113, MATH 3670, CEE 3770, and ISYE 3770 are restricted from free electives.
7 These hours may be shared with a minor.

Bachelor of Science in Mathematics - Discrete Mathematics

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 1050	The Science of Physical Activity and Health	
or APPH 1055	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [1]	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus	2
or MATH 1501	Introduction to Differential Calculus	
MATH 1553	Introduction to Linear Algebra	2
or MATH 1554	Linear Algebra	
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3

HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
CS 1331	Introduction to Object Oriented Programming	3
Lab Science		4
MATH 2551	Multivariable Calculus	4
or MATH 2561	Honors Multivariable Calculus	
MATH 2552	Differential Equations	4
or MATH 25	Honors Differential Equations	
MATH 2106	Foundations of Mathematical Proof	3
Bridging Courses		
MATH 3012	Applied Combinatorics	3
MATH 3235	Probability Theory	3
MATH 3406	A Second Course in Linear Algebra	3
Upper Level Foundation Courses		
MATH 4107	Introduction to Abstract Algebra I [2]	3
MATH 4317	Analysis I [2]	3
MATH 4320	Complex Analysis [2]	3
Discrete Mathematics Concentration		
CS 3510	Design and Analysis of Algorithms	3
or CS 3511	Design and Analysis of Algorithms, Honors	
MATH 4022	Introduction to Graph Theory	3
MATH 4032	Combinatorial Analysis	3
ISYE 3133	Engineering Optimization	3
or MATH 45	Linear Programming	
Select six hours: [7]		6
ECON 4180	Game Theory for Economics	
or ECE 4	Game Theory and Multiagent Systems	
MATH 4012	Algebraic Structures in Coding Theory	
MATH 4108	Introduction to Abstract Algebra II	
MATH 4150	Introduction to Number Theory	
MATH 4280	Introduction to Information Theory	
MATH 4432	Introduction to Algebraic Topology	
MATH 4699	Undergraduate Research [3]	
CS 4510	Automata and Complexity Theory	
CS 4540	Advanced Algorithms	
ISYE 4133	Advanced Optimization	
Mathematics Elective [7]		3
Engineering or Science Electives [7]		
BIOS, CHEM, EAS, PHYS, PSYC, ECON, CS, AE, BMED, CEE, CHBE, ECE, ISYE, MSE, ME 3000-level or higher courses [4,5]		9
Free Electives		
Free Electives [6]		11
Total Credit Hours		**122**

Pass-fail only allowed for Free Electives.

Four courses from Group A list must be completed. Student may select MATH elective from Group B if four courses from Group A are complete, otherwise, the Math elective must come from Group A. If student does not complete four courses from Group A list from concentration requirements and MATH elective, then the course(s) must be completed for free electives.

Group A list: MATH 3236, MATH 4022, MATH 4032, MATH 4108, MATH 4150, MATH 4221, MATH 4261, MATH 4318, MATH 4347, MATH 4431, MATH 4432, MATH 4441, MATH 4541, MATH 4640.

Group B list: MATH 4080/MATH 4090, MATH 4222, MATH 4255, MATH 4262, MATH 4280, MATH 4348, MATH 4542, MATH 4580, MATH 4581, MATH 4641, MATH 4699, MATH 4755, MATH 4777, MATH 4782, MATH 4801, MATH 4802, CS 3510/CS 3511, CS 4510, CS 4540, CS 4641, CX 4140, CX 4240, ISYE 3133, ISYE 4133.

1 If PHYS 2231 is taken, extra hour goes toward Free Electives
2 C-minimum required
3 MATH 4699 must be an approved topic related to concentration and can only be used once.
4 CEE 3770,ISYE 3770, CS 4001, and CS 4002 are not allowed to be used here.
5 Two courses must be from the same school.
6 MATH 1113, MATH 3670, CEE 3770, and ISYE 3770 are restricted from free electives.
7 These hours may share with a minor.

Bachelor of Science in Mathematics - General

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [1]	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus	2
or MATH 15	Introduction to Differential Calculus	
MATH 1553	Introduction to Linear Algebra	2
or MATH 155	Linear Algebra	
or MATH 156	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	

INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
CS 1331	Introduction to Object Oriented Programming	3
Lab Science		4
MATH 2551	Multivariable Calculus	4
or MATH 2561	Honors Multivariable Calculus	
MATH 2552	Differential Equations	4
or MATH 25	Honors Differential Equations	
MATH 2106	Foundations of Mathematical Proof	3
Bridging Courses		
MATH 3012	Applied Combinatorics	3
MATH 3235	Probability Theory	3
MATH 3406	A Second Course in Linear Algebra	3
Upper Level Foundation Courses		
MATH 4107	Introduction to Abstract Algebra I [2]	3
MATH 4317	Analysis I [2]	3
MATH 4320	Complex Analysis [2]	3
General Mathematics [7]		**21**
Select twelve credits:		
MATH 3236	Statistical Theory	
MATH 4022	Introduction to Graph Theory	
MATH 4032	Combinatorial Analysis	
MATH 4108	Introduction to Abstract Algebra II	
MATH 4150	Introduction to Number Theory	
MATH 4221	Stochastic Processes I	
MATH 4261	Mathematical Statistics I	
MATH 4318	Analysis II	
MATH 4347	Partial Differential Equations I	
MATH 4431	Introductory Topology	
MATH 4432	Introduction to Algebraic Topology	
MATH 4441	Differential Geometry	
MATH 4541	Dynamics and Bifurcations I	
MATH 4640	Numerical Analysis I	
Select nine credits (or, select nine credits from previous list):		
MATH 4012	Algebraic Structures in Coding Theory	
MATH 4080 & MATH 40	Senior Project I and Senior Project II	
MATH 4222	Stochastic Processes II	
MATH 4255	Monte Carlo Methods	
MATH 4262	Mathematical Statistics II	
MATH 4280	Introduction to Information Theory	
MATH 4348	Partial Differential Equations II	
MATH 4542	Dynamics and Bifurcations II	
MATH 4580	Linear Programming	
MATH 4581	Classical Mathematical Methods in Engineering	
MATH 4641	Numerical Analysis II	
MATH 4699	Undergraduate Research [3]	
MATH 4755	Mathematical Biology	
MATH 4777	Vector and Parallel Scientific Computation	
MATH 4782	Quantum Information and Quantum Computing	
MATH 4801	Special Topics	
MATH 4802	Special Topics	
CS 3510	Design and Analysis of Algorithms	
or CS 35	Design and Analysis of Algorithms, Honors	
CS 4510	Automata and Complexity Theory	
CS 4540	Advanced Algorithms	
CS 4641	Machine Learning	
CX 4140	Computational Modeling Algorithms	
CX 4240	Introduction to Computing for Data Analysis	
CS 4530	Randomized Algorithms	
ECON 3161	Econometric Analysis	
ECON 4180	Game Theory I	
ISYE 3133	Engineering Optimization	
ISYE 4031	Regression and Forecasting	
ISYE 4133	Advanced Optimization	
Engineering or Science Electives [7]		
BIOS, CHEM, EAS, PHYS, PSYC, ECON, CS, AE, BMED, CEE, CHBE, ECE, ISYE, MSE, ME 3000-level or higher courses [4,5]		9
Free Electives		
Free Electives [6]		11
Total Credit Hours		**122**

Pass-fail only allowed for Free Electives.

Four courses from Group A list must be completed. Student may select MATH elective from Group B if four courses from Group A are complete, otherwise, the Math elective must come from Group A. If student does not complete four courses from Group A list from concentration requirements and MATH elective, then the course(s) must be completed for free electives.

Group A list: MATH 3236, MATH 4022, MATH 4032, MATH 4108, MATH 4150, MATH 4221, MATH 4261, MATH 4318, MATH 4347, MATH 4431, MATH 4432, MATH 4441, MATH 4541, MATH 4640.

Group B list: MATH 4012, MATH 4080/MATH 4090, MATH 4222, MATH 4255, MATH 4262, MATH 4280, MATH 4348, MATH 4542, MATH 4580, MATH 4581, MATH 4641, MATH 4699, MATH 4755, MATH 4777, MATH 4782, MATH 4801, MATH 4802, CS 3510/CS 3511, CS 4510, CS 4540, CS 4641, CX 4140, CX 4240, ECON 3161, ECON 4180, ISYE 4031, ISYE 3133, ISYE 4133.

1 If PHYS 2231 is taken, extra hour goes toward Free Electives
2 C-minimum required
3 MATH 4699 must be an approved topic and can be used up to 6 hours.
4 CEE 3770,ISYE 3770, CS 4001, and CS 4002 are not allowed to be used here.
5 Two courses must be from the same school.
6 MATH 1113, MATH 3670, CEE 3770, and ISYE 3770 are restricted from free electives.
7 These hours may share with a minor.

Bachelor of Science in Mathematics - Pure Mathematics

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [1]	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus	2
or MATH 15	Introduction to Differential Calculus	
MATH 1553	Introduction to Linear Algebra	2
or MATH 155	Linear Algebra	
or MATH 155	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
CS 1331	Introduction to Object Oriented Programming	3
Lab Science		4
MATH 2551	Multivariable Calculus	4
or MATH 255	Honors Multivariable Calculus	
MATH 2552	Differential Equations	4
or MATH 25	Honors Differential Equations	
MATH 2106	Foundations of Mathematical Proof	3
Bridging Courses		
MATH 3012	Applied Combinatorics	3
MATH 3235	Probability Theory	3
MATH 3406	A Second Course in Linear Algebra	3
Upper Level Foundation Courses		
MATH 4107	Introduction to Abstract Algebra I [2]	3
MATH 4317	Analysis I [2]	3
MATH 4320	Complex Analysis [2]	3
Pure Mathematics Concentration		
MATH 4318	Analysis II	3
MATH 4108	Introduction to Abstract Algebra II	3
or MATH 41	Introduction to Number Theory	
MATH 4431	Introductory Topology	3
or MATH 443	Introduction to Algebraic Topology	
or MATH 444	Differential Geometry	
Select nine credits: [7]		9
MATH 4022	Introduction to Graph Theory	
MATH 4032	Combinatorial Analysis	
MATH 4108	Introduction to Abstract Algebra II	
MATH 4150	Introduction to Number Theory	
MATH 4221	Stochastic Processes I	
MATH 4222	Stochastic Processes II	
MATH 4347	Partial Differential Equations I	
MATH 4348	Partial Differential Equations II	
MATH 4431	Introductory Topology	
MATH 4432	Introduction to Algebraic Topology	
MATH 4441	Differential Geometry	
MATH 4541	Dynamics and Bifurcations I	
MATH 4542	Dynamics and Bifurcations II	
MATH 4699	Undergraduate Research [3]	
Mathematics Elective [7]		3
Engineering or Science Electives [7]		
BIOS, CHEM, EAS, PHYS, PSYC, ECON, CS, AE, BMED, CEE, CHBE, ECE, ISYE, MSE, ME 3000-level or higher courses [4,5]		9
Free Electives		
Free Electives [6]		11
Total Credit Hours		**122**

Pass-fail only allowed for Free Electives.

Four courses from Group A list must be completed. Student may select MATH elective from Group B if four courses from Group A are complete, otherwise, the Math elective must come from Group A. If student does not complete four courses from Group A list from concentration requirements and MATH elective, then the course(s) must be completed for free electives.

Group A list: MATH 3236, MATH 4022, MATH 4032, MATH 4108, MATH 4150, MATH 4221, MATH 4261, MATH 4318, MATH 4347, MATH 4431, MATH 4432, MATH 4441, MATH 4541, MATH 4640.

Group B list: MATH 4080/MATH 4090, MATH 4222, MATH 4255, MATH 4262, MATH 4280, MATH 4348, MATH 4542, MATH 4580, MATH 4581, MATH 4641, MATH 4699, MATH 4755, MATH 4777, MATH 4782, MATH 4801, MATH 4802, CS 3510/CS 3511, CS 4510, CS 4540, CS 4641, CX 4140, CX 4240, ISYE 3133, ISYE 4133.

1 If PHYS 2231 is taken, extra hour goes toward Free Electives
2 C-minimum required
3 MATH 4699 must be an approved topic related to concentration and can only be used once.
4 CEE 3770,ISYE 3770, CS 4001, and CS 4002 are not allowed to be used here.
5 Two courses must be from the same school.
6 MATH 1113, MATH 3670, CEE 3770, and ISYE 3770 are restricted from free electives.
7 These hours may share with a minor.

Bachelor of Science in Mathematics - Probability and Statistics

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [1]	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus	2
or MATH 15	Introduction to Differential Calculus	
MATH 1553	Introduction to Linear Algebra	2
or MATH 155	Linear Algebra	
or MATH 155	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
CS 1331	Introduction to Object Oriented Programming	3
Lab Science		4
MATH 2551	Multivariable Calculus	4
or MATH 255	Honors Multivariable Calculus	
MATH 2552	Differential Equations	4
or MATH 25	Honors Differential Equations	
MATH 2106	Foundations of Mathematical Proof	3
Bridging Courses		
MATH 3012	Applied Combinatorics	3
MATH 3235	Probability Theory	3
MATH 3406	A Second Course in Linear Algebra	3
Upper Level Foundation Courses		
MATH 4107	Introduction to Abstract Algebra I [2]	3
MATH 4317	Analysis I [2]	3
MATH 4320	Complex Analysis [2]	3
Probability and Statistics Concentration		
MATH 3236	Statistical Theory	3
or MATH 425	Mathematical Statistics I	
MATH 4221	Stochastic Processes I	3
Select twelve credits: [7]		12
ECON 3161	Econometric Analysis	
ISYE 4031	Regression and Forecasting	
MATH 4222	Stochastic Processes II	
MATH 4255	Monte Carlo Methods	
MATH 4262	Mathematical Statistics II	
MATH 4280	Introduction to Information Theory	
or ISYE 433	Advanced Optimization	
MATH 4580	Linear Programming	
MATH 4699	Undergraduate Research [3]	
CX 4240	Introduction to Computing for Data Analysis	
or CS 46	Machine Learning	
Mathematics Elective [7]		3
Engineering or Science Electives [7]		
BIOS, CHEM, EAS, PHYS, PSYC, ECON, CS, AE, BMED, CEE, CHBE, ECE, ISYE, MSE, ME 3000-level or higher courses [4,5]		9
Free Electives		
Free Electives [6]		11
Total Credit Hours		**122**

Pass-fail only allowed for Free Electives.

Four courses from Group A list must be completed. Student may select MATH elective from Group B if four courses from Group A are complete, otherwise, the Math elective must come from Group A. If student does not complete four courses from Group A list from concentration requirements and MATH elective, then the course(s) must be completed for free electives.

Group A list: MATH 3236, MATH 4022, MATH 4032, MATH 4108, MATH 4150, MATH 4221, MATH 4261, MATH 4318, MATH 4347, MATH 4431, MATH 4432, MATH 4441, MATH 4541, MATH 4640.

Group B list: MATH 4080/MATH 4090, MATH 4222, MATH 4255, MATH 4262, MATH 4280, MATH 4348, MATH 4542, MATH 4580, MATH 4581, MATH 4641, MATH 4699, MATH 4755, MATH 4777, MATH 4782, MATH 4801, MATH 4802, CS 3510/CS 3511, CS 4510, CS 4540, CS 4641, CX 4140, CX 4240, ISYE 3133, ISYE 4133.

1. If PHYS 2231 is taken, extra hour goes toward Free Electives
2. C-minimum required
3. MATH 4699 must be an approved topic related to concentration and can only be used once.
4. CEE 3770,ISYE 3770 , CS 4001, and CS 4002 are not allowed to be used here.
5. Two courses must be from the same school.
6. MATH 1113, MATH 3670, CEE 3770, and ISYE 3770restricted from free electives.

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

The undergraduate curriculum in mechanical engineering (ME) is very broad and flexible. The curriculum comprises a ME core of fundamental concepts, plus a design/professional-practice stem, plus 15 credit hours of free electives. The program prepares students to be problem solvers and to contribute to a wide range of industries and businesses, or to go on for further study in graduate school. There is a strong emphasis in the ME program on design, creativity, and hands-on learning. Due to the wide range of career choices open to MEs, the program incorporates courses in electronics, materials science, computer programming, and manufacturing. The large number of free elective hours allows students to pursue minors and certificates throughout the Institute, or to specialize in areas within ME. The flexibility also helps students to pursue a variety of special programs including co-op, internships, study abroad, and undergraduate research.

Program Educational Objectives

The faculty of the Woodruff School strives to continuously improve our undergraduate programs in mechanical engineering. The educational objectives reflect the needs, and have been reviewed by, among others, the Advisory Board of the Woodruff School, the faculty, and the students.

- Our graduates will be recognized leaders in ME–related fields or other career paths, including industry, academe, government, and non-governmental organizations.
- Our graduates will be global collaborators, leading and participating in culturally diverse teams, fostering inclusive environments, and acting ethically to discover and apply new knowledge and engineering practices
- Our graduates will continue to grow professionally and will strive to acquire new skills and new knowledge throughout their careers.
- Our graduates will be entrepreneurially minded innovators who have a positive economic, social, and environmental impact on their communities, the nation, and society as a whole.

The Woodruff School of Mechanical Engineering has established concentration areas in sub-fields of Mechanical Engineering. Concentrations are optional for the students; they are not required. The Concentrations are each fifteen hours of classes, and will satisfy the Design Elective, the ME Elective and nine hours of Free Electives. The current Concentrations are:

- General
- Automotive
- Automation and Robotic System
- Design
- Manufacturing
- Mechanics of Materials
- Micro- and Nano-Engineering
- Nuclear and Radiological Engineering
- Thermal, Fluid and Energy Systems

International Plan

Mechanical Engineering majors may choose to participate in the Georgia Tech International Plan. Students who complete the requirements of the International Plan have the degree designation noted on their transcripts and on their diploma. The International Plan has specific requirements which must be completed including:

1. a minimum of 26 weeks abroad in educational, research, or work internships,
2. a language requirement,
3. courses specifically designated for global economics, international affairs, and global competency, and
4. a capstone project, typically one which is based on the student's ME capstone design experience.

Complete requirements may be found at http://oie.gatech.edu/content/international-plan.

Cooperative Plan

Since 1912, Georgia Tech has offered an Undergraduate Cooperative Program to those students who wish to combine career-related experience with classroom studies. Students alternate between industrial assignments and classroom studies until they complete three semesters of work. Co-op students with mechanical engineering majors complete the same coursework on campus that is completed by non-co-op students. Most co-op students begin the program as sophomores or juniors and are classified as full-time students regardless of whether they are attending classes on campus or are full-time at an employer's location. Co-op employment opportunities exist across the USA, and even in foreign countries. Depending on the chosen country, proficiency in a foreign language is usually necessary. Mechanical engineering students have worked in countries such as Germany, China, and Japan.

Students who participate in the co-op program have the opportunity to develop career interests, become more confident in their career choices, and develop human relation skills through their work experience. Graduates of the program receive a bachelor's degree with a Cooperative Plan Designation. For more information about the Cooperative Program, go to www.coop.gatech.edu.

For more information about all of the programs in the Center for Career Discovery and Development, visit www.careerdiscovery.gatech.edu.

Research Option

The School of Mechanical Engineering offers the 'Research Option' (RO) under the BSME degree program. In order to graduate with a BSME (RO) degree, students must:

- Complete at least nine units of supervised research over at least two (preferably three) terms. The research must either be for pay (ME 4698) or credit (ME 4699). Up to six hours of research for credit may be used towards the BSME free elective requirements.
- Write an undergraduate thesis or other substantial, written report showing results of the research. This is usually done during the graduating term.
- Take both LMC 4701 (typically during the first or second semester of research) and LMC 4702 (during the thesis-writing semester).

At least six of the nine required credit hours of research should be on the same topic. A research proposal must be approved by a faculty advisor and one other faculty member. This proposal will be written in LMC 4701 which serves as a pre-requisite for LMC 4702. Completion of the Research Option is noted on students' transcripts.

The BS/MS Program

The Woodruff School offers a BS/MS program for those students who demonstrate an interest in and ability for additional education beyond the BS degree. Mechanical engineering students are eligible to apply to the program after the completion of 30 semester credit hours at Georgia Tech and appropriate progress in their degree program. One of the advantages of the program is that it allows students to use 6 hours of free-elective credit to be counted towards both the BS and the MS degree. Therefore, students should apply to the program at least three semesters prior to graduation in order to take full advantage of the Graduate Course Option. Students must have a Georgia Tech GPA of 3.5 or higher for admission into the BS/MS Program. Further information, rules, and restrictions may be found at the Woodruff School site.

Participants in the BS/MS Program in the Woodruff School can obtain a master's degree in mechanical engineering, nuclear engineering, medical physics, or in Georgia Tech's interdisciplinary bioengineering graduate program. There are two options to consider.

Non-Thesis Option

The Non-Thesis Option is completed by taking 10 classes according to the MS degree requirements. With proper planning, most MS non-thesis degrees could be completed within three semesters beyond the BS degree.

Thesis Option

The Thesis Option involves working with a faculty member on a project in a wide range of research topics being investigated by Woodruff School faculty members. This will give the student hands-on experience in working with a faculty mentor; the opportunity to work in a laboratory or a research environment; and the chance to perform cutting edge theoretical and experimental work. These efforts will foster the student's career interests and expand their job prospects with certain employers. In some cases, a student will receive a graduate research assistantship, which includes a stipend and a tuition waiver.

BS/MS Information

Bachelor of Science in Mechanical Engineering - Automation and Robotic Systems

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1371	Computing for Engineers	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus [2]	2
MATH 1553	Introduction to Linear Algebra [2]	2
or MATH 1554	Linear Algebra	
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
CHEM 1310	Principles of General Chemistry for Engineers [6]	4
ME 1670	Introduction to Engineering Graphics and Design	3
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
MSE 2001	Principles and Applications of Engineering Materials	3
Ethics Requirement [1]		
Major Requirements		
COE 2001	Statics [2]	2
ME 2016	Computer Applications	3
ME 2110	Creative Decisions and Design	3
ME 2202	Dynamics of Rigid Bodies	3
ME 3017	System Dynamics	3
ME 3057	Experimental Methodology and Technical Writing	3
ME 3322	Thermodynamics	3
ME 3340	Fluid Mechanics	3
ME 3345	Conduction and Radiation Heat Transfer	3
COE 3001	Mechanics of Deformable Bodies	3
ME 3210	Design, Materials, and Manufacture	3
ME 4056	Mechanical Engineering Systems Laboratory	3
ME 4182	Mechanical Design Engineering	3
or ME 4723	Interdisciplinary Capstone Design	
Other Engineering Requirements		
ECE 3710	Circuits and Electronics	2
ECE 3741	Instrumentation and Electronics Lab	1
ISYE 3025	Essentials of Engineering Economy	1
MATH 3670	Probability and Statistics with Applications	3
Automation and Robotic Systems Concentration		
ME 3180	Machine Design	3
ME 4452	Control of Dynamic Systems	3

Select one of the following: [3]		9
CS 3600	Introduction to Artificial Intelligence	
CS 4641	Machine Learning	
ME 4012	Modeling and Control of Motion Systems	
ME 4189	Structural Vibrations	
ME 4405	Fundamentals of Mechatronics	
ME 4451	Robotics	
Free Electives		
Free Electives [3,4,5]		6
Total Credit Hours		**129**

No pass-fail courses allowed.

Student must earn a 2.0 GPA within Major Requirements and the following:

Code	Title	Credit Hours
MSE 2001	Principles and Applications of Engineering Materials	3
ECE 3710	Circuits and Electronics	2
ECE 3741	Instrumentation and Electronics Lab	1
ISYE 3025	Essentials of Engineering Economy	1

If a course is repeated, only the latest grade is included in the calculation of the Major Requirements GPA.

1 Students must complete one Ethics course during their program.
2 Minimum grade of C required.
3 At least 3 credit hours in either the Concentration Electives or Free Electives must be a 3000-level or higher ME course. ME 3141, ME 3700, ME 3720, ME 3743, ME 3744, ME 4699, ME 4741, ME 4742, ME 4753, and ME 4903 are not allowed.
4 Excludes CEE 2040, PHYS 2802, PHYS 2XXX (AP credit) and MGT 2250.
5 Students can use a maximum of 6 credit hours of VIP courses or a maximum of 6 credit hours of undergraduate research and special problems courses (2699, 4699, 4903 from any department) not to exceed 9 credit hours from both course groups towards the degree requirements for the BSME degree.
6 CHEM 1211K can substitute for CHEM 1310. CHEM 1211K and CHEM 1212K are recommended for pre-health students.

Bachelor of Science in Mechanical Engineering - Automotive

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1371	Computing for Engineers	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus [2]	2
MATH 1553	Introduction to Linear Algebra [2]	2
or MATH 155	Linear Algebra	
or MATH 156	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
CHEM 1310	Principles of General Chemistry for Engineers [6]	4
ME 1670	Introduction to Engineering Graphics and Design	3
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
MSE 2001	Principles and Applications of Engineering Materials	3
Ethics Requirement [1]		
Major Requirements		
COE 2001	Statics [2]	2
ME 2016	Computer Applications	3
ME 2110	Creative Decisions and Design	3
ME 2202	Dynamics of Rigid Bodies	3
ME 3017	System Dynamics	3
ME 3057	Experimental Methodology and Technical Writing	3
ME 3322	Thermodynamics	3
ME 3340	Fluid Mechanics	3
ME 3345	Conduction and Radiation Heat Transfer	3
COE 3001	Mechanics of Deformable Bodies	3
ME 3210	Design, Materials, and Manufacture	3
ME 4056	Mechanical Engineering Systems Laboratory	3
ME 4182	Mechanical Design Engineering	3
or ME 4723	Interdisciplinary Capstone Design	
Other Engineering Requirements		
ECE 3710	Circuits and Electronics	2
ECE 3741	Instrumentation and Electronics Lab	1
ISYE 3025	Essentials of Engineering Economy	1
MATH 3670	Probability and Statistics with Applications	3

Automotive Concentration		
ME 4014	Introduction to Automotive Engineering	3
ME 3180	Machine Design	3
or ME 4315	Energy Systems Analysis and Design	
Select three of the following:		9
ME 4011	Internal Combustion Engines	
ME 4013	Hybrid Vehicle Powertrains	
ME 4215	Manufacturing Process Analysis	
ME 4189	Structural Vibrations	
ME 4325	Introduction to Fuel Cell Systems	
ME 4405	Fundamentals of Mechatronics	
ME 4452	Control of Dynamic Systems	
ME/CHBE 4759	Electrochemical Energy Storage and Conversion	
ME/AE 4760	Engineering Acoustics and Noise Control	
ME 4699	Undergraduate Research	
ME 4903	Special Problems	
AE 3030	Aerodynamics	
Vertically Integrated Project Course		
Free Electives		
Free Electives [3,4,5]		6
Total Credit Hours		**129**

No pass-fail courses allowed.

Student must earn a 2.0 GPA within Major Requirements and the following:

Code	Title	Credit Hours
MSE 2001	Principles and Applications of Engineering Materials	3
ECE 3710	Circuits and Electronics	2
ECE 3741	Instrumentation and Electronics Lab	1
ISYE 3025	Essentials of Engineering Economy	1

If a course is repeated, only the latest grade is included in the calculation of the Major Requirements GPA.

1 Students must complete one Ethics course during their program.
2 Minimum grade of C required.
3 At least 3 credit hours in either the Concentration Electives or Free Electives must be a 3000-level or higher ME course. ME 3141, ME 3700, ME 3720, ME 3743, ME 3744, ME 4699, ME 4741, ME 4742, ME 4753, and ME 4903 are not allowed.
4 Excludes CEE 2040, PHYS 2802, PHYS 2XXX (AP credit) and MGT 2250.
5 Students can use a maximum of 6 credit hours of VIP courses or a maximum of 6 credit hours of undergraduate research and special problems courses (2699, 4699, 4903 from any department) not to exceed 9 credit hours from both course groups towards the degree requirements for the BSME degree.
6 CHEM 1211K can substitute for CHEM 1310. CHEM 1211K and CHEM 1212K are recommended for pre-health students.

Bachelor of Science in Mechanical Engineering - General

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1371	Computing for Engineers	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus [2]	2
MATH 1553	Introduction to Linear Algebra [2]	2
or MATH 1554	Linear Algebra	
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
CHEM 1310	Principles of General Chemistry for Engineers [7]	4
ME 1670	Introduction to Engineering Graphics and Design	3
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
MSE 2001	Principles and Applications of Engineering Materials	3
Ethics Requirement [1]		
Major Requirements		
ME 3180	Machine Design	3
or ME 4315	Energy Systems Analysis and Design	
COE 2001	Statics [2]	2
ME 2016	Computer Applications	3

ME 2110	Creative Decisions and Design	3
ME 2202	Dynamics of Rigid Bodies	3
ME 3017	System Dynamics	3
ME 3057	Experimental Methodology and Technical Writing	3
ME 3322	Thermodynamics	3
ME 3340	Fluid Mechanics	3
ME 3345	Conduction and Radiation Heat Transfer	3
COE 3001	Mechanics of Deformable Bodies	3
ME 3210	Design, Materials, and Manufacture	3
ME 4056	Mechanical Engineering Systems Laboratory	3
ME 4182	Mechanical Design Engineering	3
or ME 4723	Interdisciplinary Capstone Design	
ME Electives		
ME 3000-level Electives [3]		3
Other Engineering Requirements		
ECE 3710	Circuits and Electronics	2
ECE 3741	Instrumentation and Electronics Lab	1
ISYE 3025	Essentials of Engineering Economy	1
MATH 3670	Probability and Statistics with Applications	3
Free Electives		
2000-Level Electives [4,5]		9
Free Electives [4,6]		6
Total Credit Hours		**129**

No pass-fail courses allowed.

Student must earn a 2.0 GPA within Major Requirements and MSE 2001,ECE 3710, ECE 3741 and ISYE 3025.

If a course is repeated, only the latest grade is included in the calculation of the Major Requirements GPA.

1. Students must complete one Ethics course during their program.
2. Minimum grade of C required.
3. ME Electives must be 3000-level electives. ME 3141,ME 3700, ME 3720, ME 3743, ME 3744, ME 4699, ME 4741, ME 4742, ME 4753, and ME 4903 are not allowed. ME Elective must not duplicate any other material used for BSME degree.
4. Cannot include CEE 2040, PHYS 2802,PHYS 2XXX(AP Credit),MGT 2250.
5. Must be at 2000-Level or above; four of these 9 credit hours may be satisfied with one of the following: BIOS 1107/BIOS 1107L, BIOS 1108/BIOS 1108L, or CHEM 1212K.
6. Students can use a maximum of 6 credit hours of VIP courses (ECE 2811, 381X, 481X) or a maximum of 6 credit hours of undergraduate research and special problems courses (2699, 4699, 4903 from any department) not to exceed 9 credit hours from both course groups towards the degree requirements for the BSME degree.
7. CHEM 1211K can substitute for CHEM 1310. CHEM 1211K and CHEM 1212K are recommended for pre-health students.

Bachelor of Science in Mechanical Engineering - Design

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1371	Computing for Engineers	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus [2]	2
MATH 1553	Introduction to Linear Algebra [2]	2
or MATH 1554	Linear Algebra	
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
CHEM 1310	Principles of General Chemistry for Engineers [6]	4
ME 1670	Introduction to Engineering Graphics and Design	3
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
MSE 2001	Principles and Applications of Engineering Materials	3
Ethics Requirement [1]		
Major Requirements		
COE 2001	Statics [2]	2
ME 2016	Computer Applications	3
ME 2110	Creative Decisions and Design	3
ME 2202	Dynamics of Rigid Bodies	3

ME 3017	System Dynamics	3
ME 3057	Experimental Methodology and Technical Writing	3
ME 3322	Thermodynamics	3
ME 3340	Fluid Mechanics	3
ME 3345	Conduction and Radiation Heat Transfer	3
COE 3001	Mechanics of Deformable Bodies	3
ME 3210	Design, Materials, and Manufacture	3
ME 4056	Mechanical Engineering Systems Laboratory	3
ME 4182	Mechanical Design Engineering	3
or ME 4723	Interdisciplinary Capstone Design	
Other Engineering Requirements		
ECE 3710	Circuits and Electronics	2
ECE 3741	Instrumentation and Electronics Lab	1
ISYE 3025	Essentials of Engineering Economy	1
MATH 3670	Probability and Statistics with Applications	3
Design Concentration		
ME 3180	Machine Design [7]	3
or ME 4315	Energy Systems Analysis and Design	
Electives:		12
ME 4042	Interactive Computer-Aided Design and Computer-Aided Engineering	
ME 4171	Environmentally Conscious Design and Manufacturing	
ME 4193	Design and Materials Selection for Tribological Applications	
ME 3180	Machine Design [7]	
or ME 4315	Energy Systems Analysis and Design	
ME 4699	Undergraduate Research [5]	
Vertically Integrated Project courses [5]		
ME/BIOS/BMED/MSE/ISYE 4740	Biologically Inspired Design	
ME/NRE 4725	Probabilistic Risk Assessment	
ME/MSE 4790	Materials Selection and Design	
Free Electives		
Free Electives [3,4,5]		6
Total Credit Hours		**129**

No pass-fail courses allowed.

Student must earn a 2.0 GPA within Major Requirements and the following:

Code	Title	Credit Hours
MSE 2001	Principles and Applications of Engineering Materials	3
ECE 3710	Circuits and Electronics	2
ECE 3741	Instrumentation and Electronics Lab	1
ISYE 3025	Essentials of Engineering Economy	1

If a course is repeated, only the latest grade is included in the calculation of the Major Requirements GPA.

1 Students must complete one Ethics course during their program.
2 Minimum grade of C required.
3 At least 3 credit hours in either the Concentration Electives or Free Electives must be a 3000-level or higher ME course. ME 3141, ME 3700, ME 3720, ME 3743, ME 3744, ME 4699, ME 4741, ME 4742, ME 4753, and ME 4903 are not allowed.
4 Excludes CEE 2040, PHYS 2802, PHYS 2XXX (AP credit) and MGT 2250.
5 Up to 6 credit-hours of ME 4699 and VIP coursework *combined* can be counted toward the Design Concentration. Only 3 hours maximum of ME 4699 can be applied to the Concentration.
6 CHEM 1211K can substitute for CHEM 1310. CHEM 1211K and CHEM 1212K are recommended for pre-health students.
7 Students are required to take one of the design elective courses, ME 3180 or ME 4315, as part of the Mechanical Engineering curriculum. Both courses can be included in the Design Concentration; one is required and the other can be taken as a Design elective.

Bachelor of Science in Mechanical Engineering - Manufacturing

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1371	Computing for Engineers	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus [2]	2
MATH 1553	Introduction to Linear Algebra [2]	2
or MATH 1554	Linear Algebra	
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	

ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
CHEM 1310	General Chemistry [6]	4
ME 1670	Introduction to Engineering Graphics and Design	3
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
MSE 2001	Principles and Applications of Engineering Materials	3
Ethics Requirement [1]		
Major Requirements		
COE 2001	Statics [2]	2
ME 2016	Computer Applications	3
ME 2110	Creative Decisions and Design	3
ME 2202	Dynamics of Rigid Bodies	3
ME 3017	System Dynamics	3
ME 3057	Experimental Methodology and Technical Writing	3
ME 3322	Thermodynamics	3
ME 3340	Fluid Mechanics	3
ME 3345	Conduction and Radiation Heat Transfer	3
COE 3001	Mechanics of Deformable Bodies	3
ME 3210	Design, Materials, and Manufacture	3
ME 4056	Mechanical Engineering Systems Laboratory	3
ME 4182	Mechanical Design Engineering	3
or ME 4723	Interdisciplinary Capstone Design	
Other Engineering Requirements		
ECE 3710	Circuits and Electronics	2
ECE 3741	Instrumentation and Electronics Lab	1
ISYE 3025	Essentials of Engineering Economy	1
MATH 3670	Probability and Statistics with Applications	3
Manufacturing Concentration		
ME 3180	Machine Design	3
ME 4215	Manufacturing Process Analysis	3
Select three of the following:		9
ME 4214	Mechanical Behavior of Materials	
ME 4405	Fundamentals of Mechatronics	
ME 4452	Control of Dynamic Systems	
ME 4699	Undergraduate Research	
ME 4766	Fabrication and Properties of Nanoscale Devices	
ME 4793	Composite Materials and Processes	
Free Electives		
Free Electives [3,5,6]		6
Total Credit Hours		**129**

No pass-fail courses allowed.

Student must earn a 2.0 GPA within Major Requirements and the following:

Code	Title	Credit Hours
MSE 2001	Principles and Applications of Engineering Materials	3
ECE 3710	Circuits and Electronics	2
ECE 3741	Instrumentation and Electronics Lab	1
ISYE 3025	Essentials of Engineering Economy	1

If a course is repeated, only the latest grade is included in the calculation of the Major Requirements GPA.

1 Students must complete one Ethics course during their program.

2 Minimum grade of C required.

3 At least 3 credit hours in either the Concentration Electives or Free Electives must be a 3000-level or higher ME course. ME 3141, ME 3700, ME 3720, ME 3743, ME 3744, ME 4699, ME 4741, ME 4742, ME 4753, and ME 4903 are not allowed.

4 Excludes CEE 2040, PHYS 2802, PHYS 2XXX (AP Credit) and MGT 2250.

5 Students can use a maximum of 6 credit hours of VIP courses or a maximum of 6 credit hours of undergraduate research and special problems courses (2699, 4699, 4903 from any department) not to exceed 9 credit hours from both course groups towards the degree requirements for the BSME degree.

6 CHEM 1211K can substitute for CHEM 1310. CHEM 1211K and CHEM 1212K are recommended for pre-health students.

Bachelor of Science in Mechanical Engineering - Mechanics of Materials

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1371	Computing for Engineers	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus [2]	2
MATH 1553	Introduction to Linear Algebra [2]	2
or MATH 1554	Linear Algebra	
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	

INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
CHEM 1310	Principles of General Chemistry for Engineers [6]	4
ME 1670	Introduction to Engineering Graphics and Design	3
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
MSE 2001	Principles and Applications of Engineering Materials	3
Ethics Requirement [1]		
Major Requirements		
COE 2001	Statics [2]	2
ME 2016	Computer Applications	3
ME 2110	Creative Decisions and Design	3
ME 2202	Dynamics of Rigid Bodies	3
ME 3017	System Dynamics	3
ME 3057	Experimental Methodology and Technical Writing	3
ME 3322	Thermodynamics	3
ME 3340	Fluid Mechanics	3
ME 3345	Conduction and Radiation Heat Transfer	3
COE 3001	Mechanics of Deformable Bodies	3
ME 3210	Design, Materials, and Manufacture	3
ME 4056	Mechanical Engineering Systems Laboratory	3
ME 4182	Mechanical Design Engineering	3
or ME 4723	Interdisciplinary Capstone Design	
Other Engineering Requirements		
ECE 3710	Circuits and Electronics	2
ECE 3741	Instrumentation and Electronics Lab	1
ISYE 3025	Essentials of Engineering Economy	1
MATH 3670	Probability and Statistics with Applications	3
Mechanics of Materials Concentration		
ME 3180	Machine Design	3
ME 4214	Mechanical Behavior of Materials	3
Select three of the following:		9
CEE 3020	Civil Engineering Materials	
CEE 3055	Structural Analysis	
CEE 4550	Structural Analysis II	
ME 4042	Interactive Computer-Aided Design and Computer-Aided Engineering	
ME 4699	Undergraduate Research (Mechanics of Materials)	
ME 4790	Materials Selection and Design	
ME 4791	Mechanical Behavior of Composites	
ME 4758	Biosolid Mechanics	
ME 4777	Introduction to Polymer Science and Engineering	
ME 4795	Fundamental Elements of Nuclear Reactor Materials	
MSE 4010	Environmental Degradation	
MSE 4325	Thin Film Materials Science	
BMED/ MSE 4751	Introduction to Biomaterials	
Free Electives		
Free Electives [3,4]		6
Total Credit Hours		**129**

No pass-fail courses allowed.

Student must earn a 2.0 GPA within Major Requirements and the following:

Code	Title	Credit Hours
MSE 2001	Principles and Applications of Engineering Materials	3
ECE 3710	Circuits and Electronics	2
ECE 3741	Instrumentation and Electronics Lab	1
ISYE 3025	Essentials of Engineering Economy	1

If a course is repeated, only the latest grade is included in the calculation of the Major Requirements GPA.

1 Students must complete one Ethics course during their program.
2 Minimum grade of C required.
3 At least 3 credit hours in either the Concentration Electives or Free Electives must be a 3000-level or higher ME course. ME 3141, ME 3700, ME 3720, ME 3743, ME 3744, ME 4699, ME 4741, ME 4742, ME 4753, and ME 4903 are not allowed.
4 Excludes CEE 2040, PHYS 2802, PHYS 2XXX(AP Credit) and MGT 2250.
5 Students can use a maximum of 6 credit hours of VIP courses or a maximum of 6 credit hours of undergraduate research and special problems courses (2699, 4699, 4903 from any department) not to exceed 9 credit hours from both course groups towards the degree requirements for the BSME degree.
6 CHEM 1211K can substitute for CHEM 1310. CHEM 1211K and CHEM 1212K are recommended for pre-health students.

Bachelor of Science in Mechanical Engineering - Micro- and Nanoengineering

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3

MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1371	Computing for Engineers	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus [2]	2
MATH 1553	Introduction to Linear Algebra [2]	2
or MATH 1554	Linear Algebra	
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
CHEM 1310	Principles of General Chemistry for Engineers [6]	4
ME 1670	Introduction to Engineering Graphics and Design	3
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
MSE 2001	Principles and Applications of Engineering Materials	3
Ethics Requirement [1]		
Major Requirements		
COE 2001	Statics [2]	2
ME 2016	Computer Applications	3
ME 2110	Creative Decisions and Design	3
ME 2202	Dynamics of Rigid Bodies	3
ME 3017	System Dynamics	3
ME 3057	Experimental Methodology and Technical Writing	3
ME 3322	Thermodynamics	3
ME 3340	Fluid Mechanics	3
ME 3345	Conduction and Radiation Heat Transfer	3
COE 3001	Mechanics of Deformable Bodies	3
ME 3210	Design, Materials, and Manufacture	3
ME 4056	Mechanical Engineering Systems Laboratory	3
ME 4182	Mechanical Design Engineering	3
or ME 4723	Interdisciplinary Capstone Design	
Other Engineering Requirements		
ECE 3710	Circuits and Electronics	2
ECE 3741	Instrumentation and Electronics Lab	1
ISYE 3025	Essentials of Engineering Economy	1
MATH 3670	Probability and Statistics with Applications	3
Micro- and Nanoengineering Concentration		
ME 4315	Energy Systems Analysis and Design	3
Select four of the following: [3]		12
CHBE 4020	Chemical Engineering in Nanoscale Systems	
CHBE 4050	The Science and Engineering of Microelectronic Fabrication	
CHEM 3412	Physical Chemistry II	
ME 4699	Undergraduate Research (In MEMs or Nano)	
ME 4766	Fabrication and Properties of Nanoscale Devices	
MSE 4325	Thin Film Materials Science	
MSE 4330	Fundamentals of Nanomaterials and Nanostructures	
MSE 4335	Soft Nano and Bio Materials	
PHYS 4262	Solid-state Physics	
Free Electives		
Free Electives [3,4,5]		6
Total Credit Hours		**129**

No pass-fail courses allowed.

Student must earn a 2.0 GPA within Major Requirements and the following:

Code	Title	Credit Hours
MSE 2001	Principles and Applications of Engineering Materials	3
ECE 3710	Circuits and Electronics	2
ECE 3741	Instrumentation and Electronics Lab	1
ISYE 3025	Essentials of Engineering Economy	1

If a course is repeated, only the latest grade is included in the calculation of the Major Requirements GPA.

1 Students must complete one Ethics course during their program.
2 Minimum grade of C required.
3 At least 3 credit hours in either the Concentration Electives or Free Electives must be a 3000-level or higher ME course. ME 3141, ME 3700, ME 3720, ME 3743, ME 3744, ME 4699, ME 4741, ME 4742, ME 4753, and ME 4903 are not allowed.
4 Excludes CEE 2040, PHYS 2802, PHYS 2XXX (AP Credit) and MGT 2250.
5 Students can use a maximum of 6 credit hours of VIP courses (ECE 2811, ECE 38X1, ECE 48X1) or a maximum of 6 credit hours of undergraduate research and special problems courses (2699, 4699, 4903 from any department) not to exceed 9 credit hours from both course groups towards the degree requirements for the BSME degree.
6 CHEM 1211K can substitute for CHEM 1310. CHEM 1211K and CHEM 1212K are recommended for pre-health students.

Bachelor of Science in Mechanical Engineering - Nuclear and Radiological Engineering

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1371	Computing for Engineers	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus [2]	2
MATH 1553	Introduction to Linear Algebra [2]	2
or MATH 155	Linear Algebra	
or MATH 155	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
CHEM 1310	General Chemistry [7]	4
ME 1670	Introduction to Engineering Graphics and Design	3
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
MSE 2001	Principles and Applications of Engineering Materials	3
Ethics Requirement [1]		
Major Requirements		
COE 2001	Statics [2]	2
ME 2016	Computer Applications	3
ME 2110	Creative Decisions and Design	3
ME 2202	Dynamics of Rigid Bodies	3
ME 3017	System Dynamics	3
ME 3057	Experimental Methodology and Technical Writing	3
ME 3322	Thermodynamics	3
ME 3340	Fluid Mechanics	3
ME 3345	Conduction and Radiation Heat Transfer	3
COE 3001	Mechanics of Deformable Bodies	3
ME 3210	Design, Materials, and Manufacture	3
ME 4056	Mechanical Engineering Systems Laboratory	3
ME 4182	Mechanical Design Engineering	3
or ME 4723	Interdisciplinary Capstone Design	
Other Engineering Requirements		
ECE 3710	Circuits and Electronics	2
ECE 3741	Instrumentation and Electronics Lab	1
ISYE 3025	Essentials of Engineering Economy	1
MATH 3670	Probability and Statistics with Applications	3
Nuclear Energy Concentration		
NRE 2120	Elements of Nuclear and Radiological Engineering	3
Any 3000-/4000-level NRE electives [8]		9
Required Design elective (select one):		3
ME 4315	Energy Systems Analysis and Design	
ME 3180	Machine Design	
Free Electives		
Free Electives [3,4,6]		6
Total Credit Hours		**129**

No pass-fail courses allowed.

Student must earn a 2.0 GPA within Major Requirements and the following:

Code	Title	Credit Hours
MSE 2001	Principles and Applications of Engineering Materials	3
ECE 3710	Circuits and Electronics	2
ECE 3741	Instrumentation and Electronics Lab	1
ISYE 3025	Essentials of Engineering Economy	1

If a course is repeated, only the latest grade is included in the calculation of the Major Requirements GPA.

1. Students must complete one Ethics course during their program.
2. Minimum grade of C required.
3. At least 3 credit hours in either the Concentration Electives or Free Electives must be a 3000-level or higher ME course. ME 3141, ME 3700, ME 3720, ME 3743, ME 3744, ME 4699, ME 4741, ME 4742, ME 4753, and ME 4903 are not allowed.
4. Excludes CEE 2040, PHYS 2802, PHYS 2XXX (AP Credit) and MGT 2250.
5. ME 4803/NRE 4803 must have the title 'Nuclear Reactor Materials'

[6] Students can use a maximum of 6 credit hours of VIP courses or a maximum of 6 credit hours of undergraduate research and special problems courses (2699, 4699, 4903 from any department) not to exceed 9 credit hours from both course groups towards the degree requirements for the BSME degree.

[7] CHEM 1211K can substitute for CHEM 1310. CHEM 1211K and CHEM 1212K are recommended for pre-health students.

[8] Excluding NRE 4699 or NRE 4903

Bachelor of Science in Mechanical Engineering - Thermal, Fluid, & Energy Systems

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [2]	4
Core B - Institutional Options		
CS 1371	Computing for Engineers	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [2]	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus [2]	2
MATH 1553	Introduction to Linear Algebra [2]	2
or MATH 1554	Linear Algebra	
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
CHEM 1310	Principles of General Chemistry for Engineers [6]	4
ME 1670	Introduction to Engineering Graphics and Design	3
MATH 2551	Multivariable Calculus [2]	4
MATH 2552	Differential Equations [2]	4
MSE 2001	Principles and Applications of Engineering Materials	3
Ethics Requirement [1]		
Major Requirements		
COE 2001	Statics [2]	2
ME 2016	Computer Applications	3
ME 2110	Creative Decisions and Design	3
ME 2202	Dynamics of Rigid Bodies	3
ME 3017	System Dynamics	3
ME 3057	Experimental Methodology and Technical Writing	3
ME 3322	Thermodynamics	3
ME 3340	Fluid Mechanics	3
ME 3345	Conduction and Radiation Heat Transfer	3
COE 3001	Mechanics of Deformable Bodies	3
ME 3210	Design, Materials, and Manufacture	3
ME 4056	Mechanical Engineering Systems Laboratory	3
ME 4182	Mechanical Design Engineering	3
or ME 4723	Interdisciplinary Capstone Design	
Other Engineering Requirements		
ECE 3710	Circuits and Electronics	2
ECE 3741	Instrumentation and Electronics Lab	1
ISYE 3025	Essentials of Engineering Economy	1
MATH 3670	Probability and Statistics with Applications	3
Thermal, Fluid, and Energy Systems Concentration		
ME 4315	Energy Systems Analysis and Design	3
Select four of the following: [3]		12
ME 4011	Internal Combustion Engines	
ME 4013	Hybrid Vehicle Powertrains	
ME 4321	Refrigeration and Air Conditioning	
ME 4325	Introduction to Fuel Cell Systems	
ME 4332	Renewable Energy Systems	
ME 4340	Applied Fluid Mechanics	
ME 4342	Computational Fluid Dynamics	
ME 4701	Wind Engineering	
ME 4759	Electrochemical Energy Storage and Conversion	
Free Electives		
Free Electives [3,4,5]		6
Total Credit Hours		**129**

No pass-fail courses allowed.

Student must earn a 2.0 GPA within Major Requirements and the following:

Code	Title	Credit Hours
MSE 2001	Principles and Applications of Engineering Materials	3
ECE 3710	Circuits and Electronics	2
ECE 3741	Instrumentation and Electronics Lab	1
ISYE 3025	Essentials of Engineering Economy	1

If a course is repeated, only the latest grade is included in the calculation of the Major Requirements GPA.

1 Students must complete one Ethics course during their program.
2 Minimum grade of C required.
3 At least 3 credit hours in either the Concentration Electives or Free Electives must be a 3000-level or higher ME course. ME 3141, ME 3700, ME 3720, ME 3743, ME 3744, ME 4699, ME 4741, ME 4742, ME 4753, and ME 4903 are not allowed.
4 Excludes CEE 2040, PHYS 2802, PHYS 2XXX(AP credits) and MGT 2250.
5 Students can use a maximum of 6 credit hours of VIP courses or a maximum of 6 credit hours of undergraduate research and special problems courses (2699, 4699, 4903 from any department) not to exceed 9 credit hours from both course groups towards the degree requirements for the BSME degree.
6 CHEM 1211K can substitute for CHEM 1310. CHEM 1211K and CHEM 1212K are recommended for pre-health students.

BACHELOR OF SCIENCE IN MUSIC TECHNOLOGY

The undergraduate program in the School of Music leads to a Bachelor of Science in Music Technology. In the program, students understand the role of technology in enabling new ways to access, consume, and create music. Students master the fundamentals of musicianship and audio technology and further develop these skills through a series of hands-on learning experiences across a spectrum of creative and technical domains. Students learn to create new music with technology, develop new technologies for making music, and conduct scientific research that expands our knowledge of how both humans and machines engage with music. Student projects span areas such as robotic musicianship, music informatics, brain music, and computational and cognitive musicology.

The program combines technical and artistic topics to produce graduates who have both a strong technical and creative portfolio. Students choose from a concentration in Mechanical Engineering (with a focus either in Acoustics and Vibrations or Controls and Robotics); a concentration in Electrical and Computer Engineering (with a focus on signal processing); or a general concentration in which they pursue a minor such as Computing and People or Industrial Design.

Please note that a portfolio is required for admission into the BSMT program. For more information, visit http://www.music.gatech.edu/bsmt

- Bachelor of Science in Music Technology - General
- Bachelor of Science in Music Technology - Electrical and Computer Engineering: Signal Processing
- Bachelor of Science in Music Technology - Mechanical Engineering: Acoustics and Vibrations
- Bachelor of Science in Music Technology - Mechanical Engineering: Controls and Robotics

BS/MS Option in Music Technology

Students will be eligible to apply for the program after completion of 30 semester credit hours at Georgia Tech and appropriate progress in their degree program. As a practical matter, students should apply for the program at least three semesters prior to graduation in order to take graduate-level courses prior to receiving their BS degree. Students must have a Georgia Tech GPA of 3.5 or higher for admission into the BS/MS Program in Music Technology. This program is available only to those completing a Bachelor's degree in music technology. Admissions decisions will be based on GPA and a portfolio review by the School of Music's Graduate Program Committee.

Students in the joint BS/MS program remain undergraduates until they meet the requirements for the bachelor's degree, at which point they will receive the BSMT degree. Their status will then be changed to graduate status. Graduate school application fees and the GRE requirements are waived. Once admitted, a GPA of at least 3.0 must be maintained to remain in the program. Additionally, students in the BS/MS program are eligible to use the Graduate Course Option even if their cumulative grade-point average is below 3.5 at the time they complete their bachelor's degree. The program will not penalize students who opt out after the bachelor's degree.

Note the following:

- BS/MS students may combine any concentration in the Bachelor of Science in Music Technology with either the project or thesis track in the Master of Science in Music Technology.
- BS/MS students will be expected to complete Intro to Audio Technology II before enrolling in any graduate-level coursework. This course is typically taken by students in their fourth semester of undergraduate study.
- Six credit hours may be counted towards both the undergraduate and graduate degrees as follows:
  - MUSI 6001 (Music Perception & Cognition), a requirement for the MS degree, can also fulfill the requirement of MUSI 4677 (Music Perception & Cognition) for the BS degree.
  - MUSI 6103 (Music Recording & Mixing), an elective for the MS degree, can also fulfill the requirement of MUSI 4630 (Music Recording & Mixing) for the BS degree.
  - Any other MUSI 6XXX course that fulfills a core or elective requirement for the MSMT can also be used to fulfill the MUSI Upper Division Elective Requirement for the BSMT.

Bachelor of Science in Music Technology - Electrical and Computer Engineering: Signal Processing

The Bachelor of Science in Music Technology teaches students the fundamentals of musicianship and audio technology. Students learn to create new music with technology, develop new technologies for making music, and conduct scientific research that expands our knowledge of how both humans and machines engage with music. Student projects span areas such as robotic musicianship, music informatics, brain music, and computational and cognitive musicology.

Bachelor of Science in Music Technology students will need to consult with the undergraduate advisor to choose a concentration or minor.

The Electrical and Computer Engineering Track allows students to develop in-depth audio engineering and/or signal processing skills as applied to music technology. The processing of analog and digital signals is one of the core areas of music technology and related to fields such as music information retrieval, audio effects, and sound synthesis. Students use their Breadth Block to take prescribed coursework in the School of Electrical and Computer Engineering.

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1371	Computing for Engineers	3
or CS 1301	Introduction to Computing	
or CS 1315	Introduction to Media Computation	
Core C - Humanities		
Any HUM		6

Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
Core E - Social Sciences		
HIST 2111	The United States to 1877	3
or HIST 2112	The United States since 1877	
or INTA 1200	American Government in Comparative Perspective	
or POL 1101	Government of the United States	
or PUBP 3000	American Constitutional Issues	
ECON 2100	Economic Analysis and Policy Problems	3
or ECON 2113	The Global Economy	
or ECON 2105	Principles of Macroeconomics	
or ECON 2106	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
MUSI 2010	Fundamentals of Musicianship I	3
MUSI 2011	Fundamentals of Musicianship II	3
MUSI 2012	Fundamentals of Musicianship III	3
MUSI 2013	Fundamentals of Musicianship IV	3
MUSI 2015	Laptop Orchestra	3
MUSI 2525	Introduction Audio Technology I	3
MUSI Ensemble Requirement [1]		
Major Requirements		
MUSI 2526	Introduction to Audio Technology II	3
MUSI 4630	Music Recording and Mixing	3
MUSI 3770	Project Studio: Technology [2]	4
MUSI 4677	Music Perception and Cognition	3
MUSI Upper Division (4000-level) Elective [2]		6
MUSI 4705	Music Technology Capstone I	4
MUSI Additional Electives (any MUSI 4000-level courses or ensemble courses) [1]		5
Concentration: ECE/Signal Processing		
MATH 2552	Differential Equations	4
ECE 2026	Introduction to Signal Processing	3
ECE 3084	Signals and Systems	3
ECE 3710	Circuits and Electronics	2
ECE 3741	Instrumentation and Electronics Lab	1
ECE 4270	Fundamentals of Digital Signal Processing	3
ECE 4271	Applications of Digital Signal Processing	4
ECE 4445	Audio Engineering	3
Free Electives		
Free Electives		8
Total Credit Hours		**122**

[1] Students are required to satisfy a 4-course music ensemble requirement. Course options include any four courses from the following list: MUSI 3018 or MUSI 3019 or MUSI 3121 or MUSI 3131 or MUSI 3231 or MUSI 3241 or MUSI 3251 or MUSI 3261 or MUSI 3311 or MUSI 3321 or MUSI 3411 or MUSI 3511 or MUSI 3531 or MUSI 3541 or MUSI 3551 or MUSI 3611. The courses may be used as Humanities (if course has been approved for Humanities credit) and/or free electives.

[2] Music Technology majors can choose one pathway to use VIP participation to fulfill degree requirements.
The VIP Elective Pathway: Students participate in any VIP team to fulfill an upper-division music technology elective and free electives.

- Participating in the same VIP team for five or fewer credits results in that many free-elective credits.
- Participating in the same VIP team for 6 or more credits results in 3 credits that are counted as upper division Music Technology electives and 3 credits that are counted as free electives.
- Any additional credits count as free electives.
- Any VIP team is eligible for this pathway. No approval is required by an academic advisor in music technology.

Bachelor of Science in Music Technology - General

The Bachelor of Science in Music Technology teaches students the fundamentals of musicianship and audio technology. Students learn to create new music with technology, develop new technologies for making music, and conduct scientific research that expands our knowledge of how both humans and machines engage with music. Student projects span areas such as robotic musicianship, music informatics, brain music, and computational and cognitive musicology.

Bachelor of Science in Music Technology students will need to consult with the undergraduate advisor to choose a concentration or minor.

Students in the General Concentration follow the rigorous Bachelor of Science in Music Technology curriculum. This standard curriculum lends itself most easily to using the hours of the Breadth Block to pursue a minor in another School on campus -- and students might find these two minors to be especially interesting:

Computing and People: Allows students to gain added expertise in computing as it relates to people. The minor requires 15 credit hours of coursework in the College of Computing.

Industrial Design: Allows students to strengthen skills and understanding of creative problem solving as it relates to design. The minor requires 15 credit hours of coursework in the School of Industrial Design.

While Computing and Industrial Design are good fits for this degree, they are not the only minors possible. For example, students could also pursue a minor in Film and Media Studies or Technology and Business for their Breadth Block.

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 1050	The Science of Physical Activity and Health	
or APPH 1055	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1371	Computing for Engineers	3
or CS 1301	Introduction to Computing	

or CS 1315	Introduction to Media Computation	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
Core E - Social Sciences		
HIST 2111	The United States to 1877	3
or HIST 2112	The United States since 1877	
or INTA 1200	American Government in Comparative Perspective	
or POL 1101	Government of the United States	
or PUBP 3000	American Constitutional Issues	
ECON 2100	Economic Analysis and Policy Problems	3
or ECON 210	The Global Economy	
or ECON 211	Principles of Macroeconomics	
or ECON 212	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
MUSI 2010	Fundamentals of Musicianship I	3
MUSI 2011	Fundamentals of Musicianship II	3
MUSI 2012	Fundamentals of Musicianship III	3
MUSI 2013	Fundamentals of Musicianship IV	3
MUSI 2015	Laptop Orchestra	3
MUSI 2525	Introduction Audio Technology I	3
MUSI Ensemble Requirement [1]		
Major Requirements		
MUSI 2526	Introduction to Audio Technology II	3
MUSI 4630	Music Recording and Mixing	3
MUSI 3770	Project Studio: Technology [3]	4
MUSI 4677	Music Perception and Cognition	3
MUSI Upper Division (4000-level) Elective [3]		6
MUSI 4705	Music Technology Capstone I	4
MUSI Additional Electives (any MUSI 4000-level courses or ensemble courses) [1]		5
Non-Major Cluster		
Advisor approved courses [2]		15
Free Electives		
Free Electives		16
Total Credit Hours		**122**

[1] Students are required to satisfy a 4-course music ensemble requirement. Course options include any four from the following list: MUSI 3018 or MUSI 3019 or MUSI 3121 or MUSI 3131 or MUSI 3231 or MUSI 3241 or MUSI 3251 or MUSI 3261 or MUSI 3311 or MUSI 3321 or MUSI 3411 or MUSI 3511 or MUSI 3531 or MUSI 3541 or MUSI 3551 or MUSI 3611. The courses may be used as Humanities (if course has been approved for Humanities credit) and/or free electives.

[2] General track students must have Non-Major Cluster courses approved by advisor. If student is completing a minor for this area and minor requires excess of 15 hours, then overage hours may be used towards free electives.

[3] Music Technology majors can choose one pathway to use VIP participation to fulfill degree requirements.

The VIP Elective Pathway: Students participate in any VIP team to fulfill an upper-division music technology elective and free electives.

- Participating in the same VIP team for five or fewer credits results in that many free-elective credits.
- Participating in the same VIP team for 6 or more credits results in 3 credits that are counted as upper division Music Technology electives and 3 credits that are counted as free electives.
- Any additional credits count as free electives.
- Any VIP team is eligible for this pathway. No approval is required by an academic advisor in music technology.

Bachelor of Science in Music Technology - Mechanical Engineering: Acoustics and Vibrations

The Bachelor of Science in Music Technology teaches students the fundamentals of musicianship and audio technology. Students learn to create new music with technology, develop new technologies for making music, and conduct scientific research that expands our knowledge of how both humans and machines engage with music. Student projects span areas such as robotic musicianship, music informatics, brain music, and computational and cognitive musicology.

Bachelor of Science in Music Technology students will need to consult with the undergraduate advisor to choose a concentration or minor.

The Mechanical Engineering Track allows students to develop in-depth mechanical engineering skills as applied to music technology. Mechanical engineering is directly related to music technology fields in the areas of robotic musicianship, acoustics, and instrument design. Students use their Breadth Block to take prescribed credit hours of coursework in the School of Mechanical Engineering focusing on one of the two options below:

Option 1: Acoustics and Vibrations

Option 2: Controls and Robotics

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1371	Computing for Engineers	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		

PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
Core E - Social Sciences		
HIST 2111	The United States to 1877	3
or HIST 2112	The United States since 1877	
or INTA 1200	American Government in Comparative Perspective	
or POL 1101	Government of the United States	
or PUBP 3000	American Constitutional Issues	
ECON 2100	Economic Analysis and Policy Problems	3
or ECON 2110	The Global Economy	
or ECON 2113	Principles of Macroeconomics	
or ECON 2123	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
MUSI 2010	Fundamentals of Musicianship I	3
MUSI 2011	Fundamentals of Musicianship II	3
MUSI 2012	Fundamentals of Musicianship III	3
MUSI 2013	Fundamentals of Musicianship IV	3
MUSI 2015	Laptop Orchestra	3
MUSI 2525	Introduction Audio Technology I	3
MUSI Ensemble Requirement [1]		
Major Requirements		
MUSI 2526	Introduction to Audio Technology II	3
MUSI 4630	Music Recording and Mixing	3
MUSI 3770	Project Studio: Technology [2]	4
MUSI 4677	Music Perception and Cognition	3
MUSI Upper Division (4000-level) Elective [2]		6
MUSI 4705	Music Technology Capstone I	4
MUSI Additional Electives (any MUSI 4000-level courses or ensemble courses) [1]		5
Concentration: ME/Acoustics and Vibration		
MATH 2552	Differential Equations	4
ECE 3710	Circuits and Electronics	2
COE 2001	Statics	2
ME 2202	Dynamics of Rigid Bodies	3
ME 2016	Computer Applications	3
ME 4760	Engineering Acoustics and Noise Control	3
ME 3017	System Dynamics	3
ME 4189	Structural Vibrations	3
Free Electives		
Free Electives		8
Total Credit Hours		**122**

[1] Students are required to satisfy a 4-course music ensemble requirement. Course options include any four from the following list: MUSI 3018 or MUSI 3019 or MUSI 3121 or MUSI 3131 or MUSI 3231 or MUSI 3241 or MUSI 3251 or MUSI 3261 or MUSI 3311 or MUSI 3321 or MUSI 3411 or MUSI 3511 or MUSI 3531 or MUSI 3541 or MUSI 3551 or MUSI 3611. The courses may be used as Humanities (if course has been approved for Humanities credit) and/or free electives.

[2] Music Technology majors can choose one pathway to use VIP participation to fulfill degree requirements.

The VIP Elective Pathway: Students participate in any VIP team to fulfill an upper-division music technology elective and free electives.

- Participating in the same VIP team for five or fewer credits results in that many free-elective credits.
- Participating in the same VIP team for 6 or more credits results in 3 credits that are counted as upper division Music Technology electives and 3 credits that are counted as free electives.
- Any additional credits count as free electives.
- Any VIP team is eligible for this pathway. No approval is required by an academic advisor in music technology.

Bachelor of Science in Music Technology - Mechanical Engineering: Controls and Robotics

The Bachelor of Science in Music Technology teaches students the fundamentals of musicianship and audio technology. Students learn to create new music with technology, develop new technologies for making music, and conduct scientific research that expands our knowledge of how both humans and machines engage with music. Student projects span areas such as robotic musicianship, music informatics, brain music, and computational and cognitive musicology.

Bachelor of Science in Music Technology students will need to consult with the undergraduate advisor to choose a concentration or minor.

The Mechanical Engineering Track allows students to develop in-depth mechanical engineering skills as applied to music technology. Mechanical engineering is directly related to music technology fields in the areas of robotic musicianship, acoustics, and instrument design. Students use their Breadth Block to take prescribed credit hours of coursework in the School of Mechanical Engineering focusing on one of the two options below:

Option 1: Acoustics and Vibrations

Option 2: Controls and Robotics

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 1050	The Science of Physical Activity and Health	
or APPH 1055	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1371	Computing for Engineers	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus	2

MATH 1553	Introduction to Linear Algebra	2
Core E - Social Sciences		
HIST 2111	The United States to 1877	3
or HIST 2112	The United States since 1877	
or INTA 1200	American Government in Comparative Perspective	
or POL 1101	Government of the United States	
or PUBP 3000	American Constitutional Issues	
ECON 2100	Economic Analysis and Policy Problems	3
or ECON 2110	The Global Economy	
or ECON 2113	Principles of Macroeconomics	
or ECON 2114	Principles of Microeconomics	
Any SS		6
Core F - Courses Related to Major		
MUSI 2010	Fundamentals of Musicianship I	3
MUSI 2011	Fundamentals of Musicianship II	3
MUSI 2012	Fundamentals of Musicianship III	3
MUSI 2013	Fundamentals of Musicianship IV	3
MUSI 2015	Laptop Orchestra	3
MUSI 2525	Introduction Audio Technology I	3
MUSI Ensemble Requirement [1]		
Major Requirements		
MUSI 2526	Introduction to Audio Technology II	3
MUSI 4630	Music Recording and Mixing	3
MUSI 3770	Project Studio: Technology [2]	4
MUSI 4677	Music Perception and Cognition	3
MUSI Upper Division (4000-level) Elective [2]		6
MUSI 4705	Music Technology Capstone I	4
MUSI Additional Electives (any MUSI 4000-level courses or ensemble courses) [1]		5
Concentration: ME/Controls and Robotics		
MATH 2552	Differential Equations	4
ECE 3710	Circuits and Electronics	2
COE 2001	Statics	2
ME 2202	Dynamics of Rigid Bodies	3
ME 3017	System Dynamics	3
ME 4189	Structural Vibrations	3
ME 4451	Robotics	3
or ME 4012	Modeling and Control of Motion Systems	
or ME 4405	Fundamentals of Mechatronics	
ME 4452	Control of Dynamic Systems	3
Free Electives		
Free Electives		8
Total Credit Hours		**122**

[1] Students are required to satisfy a 4-course music ensemble requirement. Course options include any four courses from the following list: MUSI 3018 or MUSI 3019 or MUSI 3121 or MUSI 3131 or MUSI 3231 or MUSI 3241 or MUSI 3251 or MUSI 3261 or MUSI 3311 or MUSI 3321 or MUSI 3411 or MUSI 3511 or MUSI 3531 or MUSI 3541 or MUSI 3551 or MUSI 3611. The courses may be used as Humanities (if course has been approved for Humanities credit) and/or free electives.

[2] Music Technology majors can choose one pathway to use VIP participation to fulfill degree requirements.

The VIP Elective Pathway: Students participate in any VIP team to fulfill an upper-division music technology elective and free electives.

- Participating in the same VIP team for five or fewer credits results in that many free-elective credits.
- Participating in the same VIP team for 6 or more credits results in 3 credits that are counted as upper division Music Technology electives and 3 credits that are counted as free electives.
- Any additional credits count as free electives.
- Any VIP team is eligible for this pathway. No approval is required by an academic advisor in music technology.

BACHELOR OF SCIENCE IN NEUROSCIENCE

Students majoring in neuroscience will complete a 120 credit-hour curriculum (plus a required 2-credit class in health). They will learn fundamental principles and up-to-date advances in the field of neuroscience.The program will build on a strong foundation of required courses in the physical sciences and mathematics (chemistry, computer science, calculus, statistics and physics) in order to prepare students with the analytical skills needed to address the complexity of problems in neuroscience.The program will emphasize technological methods and innovations that have been critical, as well as ones needed to continue progress in neuroscience.

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
or MATH 15	Calculus for Life Sciences	
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
or CS 1371	Computing for Engineers	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus	2
or MATH 15	Introduction to Differential Calculus	
MATH 1553	Introduction to Linear Algebra [1]	2
or MATH 15	Linear Algebra	
or MATH 15	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
or HIST 2	The United States since 1877	
or INTA 1	American Government in Comparative Perspective	
or POL 1	Government of the United States	
or PUBP	American Constitutional Issues	
PSYC 1101	General Psychology	3
Any SS		6
Core F - Courses Related to Major		
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
CHEM 1315	Survey of Organic Chemistry for Engineers [2]	3
or CHEM 12	Chemical Principles II	
BIOS 1107	Biological Principles	3
or BIOS 120	Biological Principles for Majors	
BIOS 1107L	Biological Principles Laboratory	1
or BIOS 120	Biological Principles Project Laboratory	
CHEM 3511	Survey of Biochemistry [3]	3
NEUR 2001	Principles in Neuroscience	4
Major Requirements		
NEUR 3001	Cell and Molecular Neuroscience	3
NEUR 3002	Neural Systems, Networks, and Behavior	3
NEUR 3003	Neuroscience of Behavior	3
NEUR 3010	Methods in Neuroscience	3
Neuroscience Depth Electives		**18**
Select one research based elective:		
NEUR 4001	Neuroscience Research Project [4]	
NEUR Thesis Option		
Select one statistics elective: [5]		
BIOS 4401	Experimental Design and Statistical Methods in Biological Sciences	
BMED 2400	Introduction to Bioengineering Statistics	
ISYE 3770/ ECE 3077	Statistics and Applications	
PSYC 2020	Psychological Statistics	
MATH 3215	Introduction to Probability and Statistics	
MATH 3225	Honors Probability and Statistics	
MATH 3670	Probability and Statistics with Applications	
10-11 credits of additional Neuroscience electives [6]		
BIOS 2600	Genetics	
BIOS 2610	Integrative Genetics	
BIOS 3450	Cell and Molecular Biology	
BIOS 3451	Cell and Molecular Biology Lab	
BIOS 3753	Human Anatomy	
BIOS 3754	Laboratory in Human Anatomy	
BIOS 3755	Human Physiology	
BIOS 3756	Physiology Laboratory	
BIOS 4200	Kinesiological Basis of Human Movement	
BIOS 4238	Ion Channels	
BIOS 4400	Human Neuroanatomy	
BIOS 4464	Developmental Biology	
BIOS 4471	Behavioral Biology	
BIOS 4480	Evolutionary Developmental Biology – How to Build an Organism	
BIOS 4651	Bioethics	
BIOS 4746	Signaling Molecules	
CHEM 4511	Biochemistry I	
CHEM 4512	Biochemistry II	
NEUR 2699	Undergraduate Research	
NEUR 4100	Neurodevelopment	
NEUR 4740	Neuroethics	
NEUR 4300	Neuroscience of Memory	
NEUR 4400	Neuroendocrinology	
NEUR 4699	Undergraduate Research	
NEUR 4803	Special Topics	
PHYS 3804	Special Topics (Neurophysics)	

	PHYS 4803	Special Topics (Physical Principles of Living Systems)
	PSYC 2015	Research Methods
	PSYC 2103	Human Development Over the Life Span
	PSYC 2230	Abnormal Psychology
	PSYC 3011	Cognitive Psychology
	PSYC 3012	Introduction to Cognitive Psychology
	PSYC 3040	Sensation and Perception
	PSYC 3041	Human Sensation and Perception
	PSYC 4100	Behavioral Pharmacology
	PSYC 4090	Cognitive Neuroscience
Breadth Electives		**15**
Free Electives		**14**
Total Credit Hours		**122**

1 MATH 1553 (2 cr.) is preferred but MATH 1554 (Linear Algebra, 4 cr.) or MATH 1564 (Linear Algebra with Vector Spaces, 4 cr.) can satisfy this requirement with the excess 2 cr. to be applied to free electives.

2 CHEM 2311 is an approved substitution for CHEM 1315 to fulfil Area F only for students who complete a full year of organic chemistry (i.e., both CHEM 2311 and CHEM 2312 or CHEM 2313 must be completed).

3 CHEM 4511 is an approved substitution for CHEM 3511 to fulfil Area F only for students who complete a full year of biochemistry (i.e., both CHEM 4511 and CHEM 4512 must be completed.

4 Four credits of NEUR 4699 credit is only allowed to substitute for NEUR 4001 if completing the Georgia Tech Research Option. The Research Option requires an additional 6 credits of research (an additional 2 credits of NEUR 4699 may be applied to "Additional Neuroscience Electives"; the additional 3 credits of research credit will be applied to Free Electives), and LMC 4701 (1 credit) and LMC 4702 (1 credit) (applied to Free Electives). A research proposal and thesis/report is also required to complete the Research Option.

5 PSYC 2020 may be completed only for students completing the Psychology Breadth Elective option.

6 Biological Sciences, Chemistry, Mathematics, and Psychology Special Topics must be approved by Neuroscience Curriculum Committee

Research Option

BS in Neuroscience students are able to complete the Georgia Tech Research Option.

To complete the research option for Neuroscience, the student must:

- Complete ten units of supervised research, over a period of preferably three but at least two terms.
- Research may be for either pay or credit [typically 4698 or 4699]* - for BS in Neuroscience, this will be NEUR 4699.
- At least six credit hours must be on the same research project, broadly defined.
- Write an undergraduate thesis or other substantial, written report showing results of the research.
- A research proposal must be approved by a faculty advisor and one other faculty member. The proposal will normally be completed at the end of the student's first semester of research, but must be approved at latest before the start of their final term of research. An approved proposal is required for admission to the class "Writing an Undergraduate Thesis" (see below).
- The thesis/report must be approved and graded by two faculty members.
- Theses will be published in the Georgia Tech Library.
- Take the two-credit class "Writing an Undergraduate Thesis." [LMC 4701 and LMC 4702]

http://www.undergradresearch.gatech.edu/research-option/

BSMS Option

The BSMS Option allows eligible students to double count a maximum of 6 credit hours toward undergraduate and graduate requirements while still completing all other program requirements to earn both degrees. The credit must be approved coursework (4000-level or higher; not seminar or research credit) completed with a grade of 'B' or higher.

To apply for the option, undergraduate Neuroscience students must have at least 30 credit hours earned at Georgia Tech with an undergraduate GPA of 3.3 or higher, and fewer than 90 credits overall (including transfer credit).

The minimum GPA to graduate with an undergraduate degree in Neuroscience to continue to the MS in Psychology program is 3.0. The minimum GPA for graduation with the MS in 2.7.

Students will need to consult with an advisor to indicate which courses are sharing with the graduate degree in DegreeWorks.

BACHELOR OF SCIENCE IN NUCLEAR AND RADIOLOGICAL ENGINEERING

The undergraduate curriculum in nuclear and radiological engineering is structured to meet the needs of both the student who contemplates employment immediately after graduation and the student planning to pursue graduate study. It provides maximum flexibility in the form of options for each student to develop their unique interests and capabilities. The core curriculum covers the basic principles of nuclear engineering, nuclear reactor core design, reactor systems engineering, nuclear power economics, reactor operations, radiation sources and detection instruments, radiation transport, radiation protection, criticality safety, regulatory requirements, and radioactive materials management.

Program Educational Objectives

The program educational objectives reflect the needs of the program's constituencies and have been reviewed and validated by our constituents:

- NRE graduates will positively contribute to nuclear and radiological engineering and related fields.
- NRE graduates will conduct themselves with the highest professional and ethical principles that include considerations of public safety and the environment.
- NRE graduates will engage in lifelong learning through graduate and continuing education, professional development activities, or other career-appropriate options.

- Bachelor of Science in Nuclear and Radiological Engineering - Nuclear Engineering
- Bachelor of Science in Nuclear and Radiological Engineering - Radiological Science and Engineering

Cooperative Plan

Since 1912, Georgia Tech has offered a five-year **Undergraduate Cooperative Program** to those students who wish to combine career-related experience with classroom studies. The program is the fourth oldest of its kind in the world and the largest optional co-op program in the country.

Students alternate between industrial assignments and classroom studies until they complete three semesters of work. Co-op students with nuclear and radiological engineering majors complete the same coursework on campus that is completed by regular four-year students. Most co-op students begin the program as freshman or sophomores and are classified as full-time students regardless whether they are attending classes on campus or are full-time at an employer's location.

Students who participate in the program have the opportunity to develop career interests, become more confident in their career choices, and develop human relation skills through their work experience. Graduates of the program receive a bachelor's degree with a Cooperative Plan Designation. Woodruff School students have traditionally been the largest group participating in the program.

Students can also complete work assignments in a foreign country as part of the **International Cooperative Program.** This program is a great opportunity to utilize foreign language skills, gain a global perspective, and experience a diverse culture. Proficiency in a foreign language is necessary to earn the International Cooperative Plan degree designation. For more information on the Cooperative Program, go to http://career.gatech.edu/co-op.

The **Undergraduate Professional Internship Program** is for nuclear and radiological engineering students who do not participate in the Cooperative Program, but want some career-related experience before graduation. Students generally work for one semester, usually in the summer, with an option for more work. Students must have completed at least thirty hours of coursework at Georgia Tech before they can participate in the program. For more details, see: http://career.gatech.edu/internships.

In addition, there is a Work Abroad Program (www.workabroad.gatech.edu), which complements a student's formal education with paid international work experience directly related to nuclear and radiological engineering. Participating students typically include juniors and seniors. The international work assignments are designed to include practical training, cross-cultural exposure and learning, and the acquisition of needed skills.

For more information about all of the programs in the Center for Career Discovery and Development, visit www.careerdiscovery.gatech.edu.

The BS/MS Program

The Woodruff School offers a BS/MS program for those students who demonstrate an interest in and ability for additional education beyond the BS degree. Woodruff School students with a GPA of 3.5 or higher are eligible to apply for the program after completion of 30 credit hours at Georgia Tech, but before the completion of seventy-five credit hours, including transfer and advanced placement credits. Students who have more than 75 credit hours will be considered for the program on a case-by-case basis

Participants in the BS/MS Program in the Woodruff School can obtain a master's degree in mechanical engineering, nuclear engineering, medical physics, or in Georgia Tech's interdisciplinary bioengineering graduate program. There are two options to consider.

Non-Thesis Option

The Non-Thesis Option is completed by taking 10 classes according to the MS degree requirements. In many cases, two courses can be counted towards both a student's BS and MS degrees, thereby streamlining the process. With proper planning, most MS non-thesis degrees could be completed in one year.

Thesis Option

The Thesis Option involves working with a faculty member on a project in a wide range of research topics being investigated by Woodruff School faculty members. This will give you hands-on experience in working with a faculty mentor; the opportunity to work in a laboratory or a research environment; and the chance to perform theoretical and experimental work. These events will foster your career interests and expand your selection of possible employers. In some cases, a student will receive a graduate research assistantship, which includes a stipend and a tuition waiver. The time to graduation depends on your thesis project, your advisor, and your work ethic.

During the first year of your graduate studies, you will be encouraged to continue for the PhD In many cases, you might be working on an

interesting topic of study as part of your master's degree research that could provide the basis for doctoral research.

BS/MS Information

Bachelor of Science in Nuclear and Radiological Engineering - Nuclear Engineering Concentration

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [1]	4
Core B - Institutional Options		
CS 1371	Computing for Engineers	3
Core C - Humanities		
Any HUM [2]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus [1]	2
MATH 1553	Introduction to Linear Algebra [1]	2
or MATH 155	Linear Algebra	
or MATH 156	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following: [3]		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS [2]		6
Core F - Courses Related to Major/Lower Division Courses		
CHEM 1310	General Chemistry [4]	4
MATH 2551	Multivariable Calculus [1]	4
MATH 2552	Differential Equations [1]	4
MSE 2001	Principles and Applications of Engineering Materials	3
NRE 2120	Elements of Nuclear and Radiological Engineering	3
Ethics Requirement [2]		
Major Requirements		
NRE 3026	Experimental Nuclear Reactor Physics	3
NRE 3112	Nuclear Radiation Detection	3
NRE 3208	Nuclear Reactor Phys I	3
NRE 3301	Radiation Physics	3
NRE 3316	Radiation Protection Engineering	3
NRE 4350	Design Methods & Tools	3
NRE 4351	Design of Nuclear and Radiological Systems	3
Non-NRE Requirements		
COE 2001	Statics	2
ECE 3710	Circuits and Electronics	2
ECE 3741	Instrumentation and Electronics Lab	1
ISYE 3025	Essentials of Engineering Economy	1
ME 3322	Thermodynamics	3
ME 3340	Fluid Mechanics	3
MATH 3670	Probability and Statistics with Applications	3
Nuclear Energy Concentration requirements [5]		
ME 3345	Conduction and Radiation Heat Transfer	3
NRE 4210	Nuclear Reactor Theory	3
NRE 4214	Reactor Engineering	3
Math/Science Elective [6]		3
Engineering Elective [7]		3
Free Electives		
Free Electives (1000-level or higher) [8]		3
Free Electives (2000-level or higher) [9]		9
Total Credit Hours		**126**

No Pass-Fail courses allowed

Students must earn a minimum Major GPA of 2.0 (truncated). Major GPA includes all required NRE and ME classes plus classes used for the concentration. If a class is repeated, only the last grade is included in the calculation.

1 Minimum grade C

2 Ethics Overlay may be Humanities or Social Sciences and can be any course from the GT-approved list: http://www.catalog.gatech.edu/academics/undergraduate/core-curriculum/ethics/.

3 Students can receive credit for only one of ECON 2100, ECON 2101, ECON 2105 and ECON 2106. The only exception is that students can receive 6 hours credit for both ECON 2105 and ECON 2106.

4 CHEM 1211K can substitute for CHEM 1310. CHEM 1211K and CHEM 1212K are recommended for pre-health students.

5 Students must satisfy the requirements of EITHER the Nuclear Engineering (NE) Concentration or the Radiological Science and Engineering (RSE) Concentration. NE Concentration requires ME 3345, NRE 4210, and NRE 4214; RSE Concentration requires NRE 4328 and two courses from the following list: NRE 4750, NRE 4803 (Nuclear Safeguards), and NRE 4407. Students may complete both Concentrations using free or engineering electives.

6 Any Math or Science at 2000 level or higher with the exception of selected 1000-level courses: BIOS 1107/BIOS 1107L, BIOS 1108/BIOS 1108, and CHEM 1212K.

7 Engineering Elective is any class from the College of Engineering at the 2000-level or higher excluding: ME 3141, ME 3700,ME 3720, ME 3743, ME 3744, ME 4741, ME 4742, and ME 4753. Also excludes project-type courses such as VIP, and 2699, 2903, 4699, 4903 classes. Cannot duplicate any other material used to satisfy the BSNRE degree requirements.

8 Free 1XXX: Cannot duplicate any other material used to satisfy the BSNRE degree requirements.

9 Free 2XXX: At least 9 hours of free electives must be at the 2000 level or above with the exception of 4 hours that may be satisfied with one of the following: BIOS 1107/BIOS 1107L, BIOS 1108/BIOS 1108L, or CHEM 1212K. Cannot duplicate any other material used to satisfy the BSNRE degree requirements

Bachelor of Science in Nuclear and Radiological Engineering - Radiological Science and Engineering concentration

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus [1]	4
Core B - Institutional Options		
CS 1371	Computing for Engineers	3
Core C - Humanities		
Any HUM [2]		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
MATH 1551	Differential Calculus [1]	2
MATH 1553	Introduction to Linear Algebra [1]	2
or MATH 155	Linear Algebra	
or MATH 156	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Select one of the following: [3]		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Select one of the following:		3
ECON 2100	Economic Analysis and Policy Problems	
ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
Any SS [2]		6
Core F - Courses Related to Major		
CHEM 1310	General Chemistry [4]	4
MATH 2551	Multivariable Calculus [1]	4
MATH 2552	Differential Equations [1]	4
MSE 2001	Principles and Applications of Engineering Materials	3
NRE 2120	Elements of Nuclear and Radiological Engineering	3
Ethics Requirement [2]		
Major Requirements		
NRE 3026	Experimental Nuclear Reactor Physics	3
NRE 3112	Nuclear Radiation Detection	3
NRE 3208	Nuclear Reactor Phys I	3
NRE 3301	Radiation Physics	3
NRE 3316	Radiation Protection Engineering	3
NRE 4350	Design Methods & Tools	3
NRE 4351	Design of Nuclear and Radiological Systems	3
Non-NRE Requirements		
COE 2001	Statics	2
ECE 3710	Circuits and Electronics	2
ECE 3741	Instrumentation and Electronics Lab	1
ISYE 3025	Essentials of Engineering Economy	1
ME 3322	Thermodynamics	3
ME 3340	Fluid Mechanics	3
MATH 3670	Probability and Statistics with Applications	3
Radiological Science and Engineering Concentration requirements [5]		
NRE 4328	Radiation Sources and Applications	3
Select two courses:		6
NRE 4407	Introduction to Radiobiology and Oncology	
NRE 4750	Diagnostic Imaging Physics	
NRE 4803	Nuclear Safeguards	
Math/Science Elective [6]		3
Engineering Elective [7]		3
Free Electives		
Free Electives (1000-level or higher) [8]		3
Free Electives (2000-level or higher) [9]		9
Total Credit Hours		**126**

No Pass-Fail courses allowed

Students must earn a minimum Major GPA of 2.0 (truncated). Major GPA includes all required NRE and ME classes plus classes used for the concentration. If a class is repeated, only the last grade is included in the calculation.

1 Minimum grade C

2 Ethics Overlay may be Humanities or Social Sciences and can be any course from the GT-approved list: http://www.catalog.gatech.edu/academics/undergraduate/core-curriculum/ethics/.

3 Students can receive credit for only one of ECON 2100, ECON 2101, ECON 2105 and ECON 2106. The only exception is that students can receive 6 hours credit for both ECON 2105 and ECON 2106.

[4] CHEM 1211K can substitute for CHEM 1310. CHEM 1211K and CHEM 1212K are recommended for pre-health students.

[5] Students must satisfy the requirements of EITHER the Nuclear Engineering (NE) Concentration or the Radiological Science and Engineering (RSE) Concentration. NE Concentration requires ME 3345, NRE 4210, and NRE 4214; RSE Concentration requires NRE 4328 and two courses from the following list: NRE 4750, NRE 4803 (Nuclear Safeguards), and NRE 4407. Students may complete both Concentrations using free or engineering electives.

[6] Any Math or Science at 2000 level or higher with the exception of selected 1000-level courses: BIOS 1107/BIOS 1107L, BIOS 1108/BIOS 1108L, and CHEM 1212K.

[7] Engineering Elective is any class from the College of Engineering at the 2000-level or higher excluding: ME 3141, ME 3700, ME 3720, ME 3743, ME 3744, ME 4741, ME 4742, and ME 4753. Also excludes project-type courses such as VIP, and 2699, 2903, 4699, 4903 classes. Cannot duplicate any other material used to satisfy the BSNRE degree requirements.

[8] Free 1XXX: Cannot duplicate any other material used to satisfy the BSNRE degree requirements.

[9] Free 2XXX: At least 9 hours of free electives must be at the 2000 level or above with the exception of 4 hours that may be satisfied with one of the following: BIOS 1107/BIOS 1107L, BIOS 1108/BIOS 1108L, or CHEM 1212K. Cannot duplicate any other material used to satisfy the BSNRE degree requirements

BACHELOR OF SCIENCE IN PHYSICS

The School of Physics offers two undergraduate degrees, the Bachelor of Science in Physics and the Bachelor of Science in Applied Physics. The basis of the Bachelor of Science in Physics degree is the traditional preparation of a student for graduate study in physics.

Each of the baccalaureate programs contains the following:

1. courses needed to meet general institutional degree requirements;
2. a core of technical courses intended to give a strong background in mathematics and the physical principles of mechanics, electricity and magnetism, thermodynamics, and the quantum theory that governs physical phenomena at the microscopic level of molecules, atoms, and nuclei;
3. technical electives that enable the student to explore areas of their choice in greater depth;
4. courses involving undergraduate research, and
5. free electives, about fifteen percent of the total hours, which may be employed to schedule additional technical or nontechnical courses.

The considerable flexibility inherent in the physics curricula is advantageous to students who wish to work out individual programs of study. At the same time, this flexibility suggests the need for consultation with advisors so students can make the best use of elective hours and avoid scheduling difficulties that may arise in later semesters. Students may utilize their elective freedom in the physics curricula to specialize in particular areas of physics, to prepare for careers in interdisciplinary areas of science, to compose a preprofessional program, or to gain a background in other technical or nontechnical disciplines. Students should contact their academic advisor for assistance in planning programs of study with emphasis directed toward a particular objective. Since some students who earn a degree in physics have transferred from other disciplines, the School has planned its degree programs to enable most students to transfer into physics with little or no loss of credit.

A total of 120 credit hours (exclusive of wellness) and a grade-point average of at least 2.0 in physics courses numbered 3000 and higher are requisites for the bachelor's degree in physics.

Physics: Undergraduate Information

- Bachelor of Science in Physics - General
- Bachelor of Science in Physics - Astrophysics
- Bachelor of Science in Physics - Business Option
- Bachelor of Science in Physics - Physics of Living Systems

Research Option in Physics

The Research Option is intended for students who seek a concentrated research experience, culminating in an undergraduate thesis, integrated into their undergraduate studies in Physics. The purpose of this program is to prepare students who plan to go on to graduate research after their BS degree. This option includes three or four semesters of focused research in the student's junior and senior years. Students who complete this option receive a designation on their transcript. For an undergraduate to fulfill the Research Option in the School of Physics, the student must fulfill the following requirements:

Code	Title	Credit Hours
PHYS 4698	Undergraduate Research Assistantship [1]	9
or PHYS 4699	Undergraduate Research	
LMC 4701	Undergraduate Research Proposal Writing [2]	1
LMC 4702	Undergraduate Research Thesis Writing [3]	1
Research Thesis [4]		
Total Credit Hours		**11**

1. At least three credits must be PHYS 4699.
2. LMC 4701: Undergraduate Research Proposal Writing -typically taken during the first or second semester of research.
   LMC 4702: Undergraduate Research Thesis Writing -taken during the term in which the thesis is completed.
3. Write and submit an undergraduate research thesis to the School of Physics based on the student's research that is approved by the student's research advisor.

Course requirements are detailed in brochures available from the School of Physics. For specific questions, students should contact the Associate Chair for Undergraduate Studies in the School of Physics.

BS/MS OPTION

The BSMS Option allows eligible students to double count a maximum of 6 credit hours toward undergraduate and graduate requirements while still completing all other program requirements to earn both degrees.

To apply for the option, undergraduate Physics students (BS in Applied Physics or BS in Physics) must have at least 30 credit hours earned at Georgia Tech with an undergraduate GPA of 3.3 or higher, and fewer than 90 credits overall (including transfer credit).

The minimum GPA to graduate with an undergraduate degree in Applied Physics/Physics to continue to the MS in Physics program is 3.0. The minimum GPA for graduation with the MS in 2.7.

Students will need to consult with an advisor to indicate which courses are sharing with the graduate degree in DegreeWorks.

Bachelor of Science in Physics - Astrophysics

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1371	Computing for Engineers	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		

PHYS 2211	Introductory Physics I [1]	4
PHYS 2212	Introductory Physics II [4]	4
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
or MATH 1554	Linear Algebra	
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Choose one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus	4
MATH 2552	Differential Equations	4
CHEM 1310	General Chemistry	4
or CHEM 1211K	Chemical Principles I	
PHYS 2213	Introduction to Modern Physics	3
PHYS 3201	Classical Mechanics I	3
Upper-Level Physics		
PHYS 3122	Electrostatics and Magnetostatics	3
PHYS 3123	Electrodynamics	3
PHYS 3141	Thermodynamics	3
PHYS 3143	Quantum Mechanics I	3
PHYS 4142	Statistical Mechanics	3
PHYS 4143	Quantum Mechanics II	3
PHYS 4321	Advanced Laboratory I	3
PHYS 4601	Senior Seminar I	1
PHYS 4602	Senior Seminar II	1
Astrophysics Concentration		
PHYS 2021	The Solar System	3
or PHYS 2022	Stars, Galaxies, and the Universe	
PHYS 3021	Nuclear Astrophysics and Stellar Evolution	3
Choose one of the following:		6
PHYS 4147	Relativity	
PHYS 4247	Cosmology	
PHYS 4347	Fundamentals of Astrophysics	
PHYS 4263	Nuclei, Particles, and Fields	
Physics Electives [2,3]		5
Free Electives		
Free Electives		19
Total Credit Hours		**122**

Student must have 2.0 in all PHYS classes 3000-level or higher

1 If PHYS 2231 is taken, extra hour goes toward Free Electives

2 Any PHYS course or CHEM 3411, CHEM 3412, CHEM 3511, EAS 2750, EAS 4300, EAS 4430, MATH 2106, MATH 3215, MATH 3235, MATH 4320, MATH 4347 MATH 4348, MATH 4581, NRE 3301, NRE 4610

3 Minimum of one class in PHYS 3211, PHYS 3226, PHYS 4322

4 If PHYS 2232 is taken, extra hour goes toward Free Electives

Bachelor of Science in Physics - Business Option

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1371	Computing for Engineers	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [1]	4
PHYS 2212	Introductory Physics II [6]	4
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
or MATH 1554	Linear Algebra	
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Choose one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
ECON 2106	Principles of Microeconomics	3
Any SS		6
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus	4
MATH 2552	Differential Equations	4
CHEM 1310	General Chemistry	4
or CHEM 12	Chemical Principles I	
PHYS 2213	Introduction to Modern Physics	3
PHYS 3201	Classical Mechanics I	3
Upper-Level Physics		
PHYS 3122	Electrostatics and Magnetostatics	3
PHYS 3123	Electrodynamics	3
PHYS 3141	Thermodynamics	3
PHYS 3143	Quantum Mechanics I	3
PHYS 4142	Statistical Mechanics	3
PHYS 4143	Quantum Mechanics II	3

PHYS 4321	Advanced Laboratory I	3
PHYS 4601	Senior Seminar I	1
PHYS 4602	Senior Seminar II	1
Physics or Technical Electives		
Any PHYS or Technical Electives [2, 3,4,5]		17
Business Option		
ACCT 2101	Accounting I: Financial Accounting	3
or MGT 300	Financial and Managerial Accounting	
MGT 3101	Organizational Behavior	3
or MGT 3150	Principles of Management	
or PSYC 2220	Industrial/Organizational Psychology	
Choose one of the following:		6
MGT 3062	Financial Management	
MGT 3078	Finance and Investments	
MGT 3300	Marketing Management I	
MGT 3660	International Business	
MGT 4015	Advanced Managerial Accounting	
MGT 4026	Financial Reporting and Analysis I	
MGT 4028	Financial Analysis and Reporting of Technology Firms	
MGT 4030	International Accounting	
MGT 4190	Strategic Quality Management and Competitiveness	
MGT 4191	The Entrepreneurship Forum	
MGT 4192	Impact Speaker Series Forum	
MGT 4193	Servant Leadership, Values & Systems	
MGT 4194	Social Enterprise and Entrepreneurship	
MGT 4303	Personal Selling and Sales Management	
MGT 4304	Strategic Brand Management	
MGT 4307	Strategic Marketing	
MGT 4335	International Marketing	
MGT 4610	Law, Management, and Economics	
MGT 4670	Entrepreneurship	
Free Electives		
Free Electives		7
Total Credit Hours		**122**

Student must have 2.0 in all PHYS classes 3000-level or higher

1 If PHYS 2231 is taken, extra hour goes toward Free Electives

2 Any PHYS course or CHEM 3411, CHEM 3412, CHEM 3511, EAS 2750, EAS 4300, EAS 4430, MATH 2106, MATH 3215, MATH 3235, MATH 4320, MATH 4347 MATH 4348, MATH 4581, NRE 3301, NRE 4610

3 Minimum of one class in PHYS 3211, PHYS 3226, PHYS 4322

4 Maximum of six credit hours below 3000-level

5 Maximum of nine credit hours PHYS 2699 or PHYS 4699

6 If PHYS 2232 is taken, extra hour goes toward Free Electives

Bachelor of Science in Physics - General

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1371	Computing for Engineers	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I [1]	4
PHYS 2212	Introductory Physics II [6]	4
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
or MATH 1554	Linear Algebra	
or MATH 1564	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Choose one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
Core F - Courses Related to Major		
MATH 2551	Multivariable Calculus	4
MATH 2552	Differential Equations	4
CHEM 1310	General Chemistry	4
or CHEM 1211K	Chemical Principles I	
PHYS 2213	Introduction to Modern Physics	3
PHYS 3201	Classical Mechanics I	3
Upper-Level Physics		
PHYS 3122	Electrostatics and Magnetostatics	3
PHYS 3123	Electrodynamics	3
PHYS 3141	Thermodynamics	3
PHYS 3143	Quantum Mechanics I	3
PHYS 4142	Statistical Mechanics	3
PHYS 4143	Quantum Mechanics II	3
PHYS 4321	Advanced Laboratory I	3
PHYS 4601	Senior Seminar I	1
PHYS 4602	Senior Seminar II	1
Physics or Technical Electives		

Any PHYS or Technical Electives [2, 3,4,5]	17
Free Electives	
Free Electives	19
Total Credit Hours	**122**

Student must have 2.0 in all PHYS classes 3000-level or higher

1 If PHYS 2231 is taken, extra hour goes toward Free Electives

2 Any PHYS course or CHEM 3411, CHEM 3412, CHEM 3511, EAS 2750, EAS 4300, EAS 4430, MATH 2106, MATH 3215, MATH 3235, MATH 4320, MATH 4347 MATH 4348, MATH 4581, NRE 3301, NRE 4610

3 Minimum of one class in PHYS 3211, PHYS 3226, PHYS 4322

4 Maximum of six credit hours below 3000-level

5 Maximum of nine credit hours PHYS 2699 or PHYS 4699

6 If PHYS 2232 is taken, extra hour goes toward Free Electives

BACHELOR OF SCIENCE IN PSYCHOLOGY

The curriculum is technically oriented and stresses quantitative and experimental approaches to the study of behavior. The undergraduate curriculum is based on a strong emphasis in the sciences and mathematics and provides an excellent preparation for graduate school in psychology, medical school, law school, and other professional and academic graduate programs. In addition, many students with the BS degree in psychology choose to enter a variety of fields, including computer software design, human resources, marketing, human factors, system design, personnel selection and training, and management.

- Bachelor of Science in Psychology - General
- Bachelor of Science in Psychology - Business Option

International Plan

Psychology's International Plan follows the Institute model to develop a global competence within the student's major program of study. It thus integrates the student's international studies and experiences with the School's quantitative and experimental approaches to the study of behavior.

In addition to the requirements for the BS in Psychology, students must complete the following:

1. take three international courses, including one from each of the following categories: international relations, global economics, and a course on a specific country or region;
2. spend two consecutive terms abroad engaged in fulfilling psychology electives (must be approved by the School of Psychology prior to enrolling in courses), free electives, humanities, and/or social science electives;
3. demonstrate language proficiency equivalent to two years of college-level language study (to be determined by testing); and,
4. incorporate the international experience within the capstone course or the senior thesis.

Research Option

The curriculum is technically oriented and stresses quantitative and experimental approaches to the study of behavior. The undergraduate curriculum is based on a strong emphasis in the sciences and mathematics and provides an excellent preparation for graduate school in psychology, medical school, law school, and other professional and academic graduate programs. The Research Plan in the School of Psychology provides additional research experience for those students seeking to continue their education in graduate school.

BSMS Option

The BSMS Option allows eligible students to double count a maximum of 6 credit hours toward undergraduate and graduate requirements while still completing all other program requirements to earn both degrees. The credit must be approved coursework (4000-level or higher; not seminar or research credit) completed with a grade of 'B' or higher.

To apply for the option, undergraduate Psychology students must have at least 30 credit hours earned at Georgia Tech with an undergraduate GPA of 3.3 or higher, and fewer than 90 credits overall (including transfer credit).

The minimum GPA to graduate with an undergraduate degree in Psychology to continue to the MS in Psychology program is 3.0. The minimum GPA for graduation with the MS in 2.7.

Students will need to consult with an advisor to indicate which courses are sharing with the graduate degree in DegreeWorks.

Bachelor of Science in Psychology - Business Option

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
or CS 1371	Computing for Engineers	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
CHEM or PHYS [1]		8
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
or MATH 15	Linear Algebra	
or MATH 15	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Choose one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
PSYC 1101	General Psychology [3]	3
PSYC 2015	Research Methods [3]	4
ECON 2106	Principles of Microeconomics [6]	2
Core F - Courses Related to Major		
BIOS 1107 & 1107L	Biological Principles and Biological Principles Laboratory	4
BIOS 1108 & 1108L	Organismal Biology and Organismal Biology Laboratory	4
PSYC 2020	Psychological Statistics [3]	4
Choose two of the following: [3]		6
PSYC 2103	Human Development Over the Life Span	
PSYC 2210	Social Psychology	

PSYC 2230	Abnormal Psychology	
PSYC 2240	Personality Theory	
Major Requirements		
Choose 8 credits from the following: [3,4,5]		8
PSYC 4011	Cognitive Psychology	
PSYC 4020	Biopsychology	
PSYC 4025	Learning and Memory	
PSYC 4041	Human Sensation and Perception	
PSYC 4031	Applied Experimental Psychology [3]	4
or PSYC 46(	Senior Thesis II	
PSYC Electives		
Choose 15 credits from the following: [2,3,7]		15
PSYC 2005	Exploring Multicultural Identities	
PSYC 2103	Human Development Over the Life Span	
PSYC 2130	Introduction to Educational Psychology	
PSYC 2210	Social Psychology	
PSYC 2220	Industrial/Organizational Psychology	
PSYC 2230	Abnormal Psychology	
PSYC 2240	Personality Theory	
PSYC 2270	Introduction to Engineering Psychology	
PSYC 2280	Psychology of Creativity and Art	
PSYC 2695	Internship	
PSYC 2699	Undergraduate Research	
PSYC 2760	Human Language Processing	
PSYC 2803	Special Topics	
PSYC 3031	Experimental Analysis of Behavior	
PSYC 3750	Human Computer Interface Design and Evaluation	
PSYC 3790	Introduction to Cognitive Science	
PSYC 3873	Special Topics	
PSYC 4010	Human Abilities	
PSYC 4011	Cognitive Psychology	
PSYC 4020	Biopsychology	
PSYC 4025	Learning and Memory	
PSYC 4041	Human Sensation and Perception	
PSYC 4050	History and Systems	
PSYC 4090	Cognitive Neuroscience	
PSYC 4100	Behavioral Pharmacology	
PSYC 4200	Advanced Topics in Cognitive Psychology	
PSYC 4260	Psychology of Aging	
PSYC 4270	Psychological Testing	
PSYC 4600	Senior Thesis I	
PSYC 4697	Psychology Undergraduate Teaching Experience	
PSYC 4699	Undergraduate Research	
Business Option		
ACCT 2101	Accounting I: Financial Accounting	3
or MGT 3000	Financial and Managerial Accounting	
MGT 3101	Organizational Behavior	3
or MGT 315	Principles of Management	
or PSYC 22(	Industrial/Organizational Psychology	
Choose two of the following:		6
MGT 3062	Financial Management	
MGT 3078	Finance and Investments	
MGT 3300	Marketing Management I	
MGT 3660	International Business	
MGT 4015	Advanced Managerial Accounting	
MGT 4026	Financial Reporting and Analysis I	
MGT 4028	Financial Analysis and Reporting of Technology Firms	
MGT 4030	International Accounting	
MGT 4190	Strategic Quality Management and Competitiveness	
MGT 4191	The Entrepreneurship Forum	
MGT 4192	Impact Speaker Series Forum	
MGT 4193	Servant Leadership, Values & Systems	
MGT 4194	Social Enterprise and Entrepreneurship	
MGT 4303	Personal Selling and Sales Management	
MGT 4304	Strategic Brand Management	
MGT 4307	Strategic Marketing	
MGT 4335	International Marketing	
MGT 4610	Law, Management, and Economics	
MGT 4670	Entrepreneurship	
Free Electives		
Free Electives		20
Total Credit Hours		**122**

Pass-fail only allowed for Free Electives.

At least 39 hours of upper division (3000/4000 level) coursework required for the degree.

At least 21 hours of 3000/4000 level psychology courses must be taken summed across major requirements and PSYC electives.

1. CHEM 1211K or CHEM 1212K or CHEM 1310 or PHYS 2211 or PHYS 2212 or PHYS 2231 or PHYS 2232.
2. Maximum of three credit hours of PSYC 2699 or PSYC 4699 (combined) can be counted towards PSYC electives.
3. Minimum grade of C required.
4. If PSYC 4020 (3 credit hour course) is taken for major field requirement choice, then one additional hour of PSYC elective is required.
5. If PSYC 4025 (3 credit hour course) is taken for major field requirement choice, then one additional hour of PSYC elective is required.
6. Extra 1 credit hour from ECON 2106 applied to Free Electives.
7. PSYC 2220 can be used as either a Business Option elective or a PSYC elective, but cannot be used to fulfill both requirements.

Bachelor of Science in Psychology - General

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		

ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1315	Introduction to Media Computation	
or CS 1371	Computing for Engineers	
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
CHEM or PHYS [1]		8
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
or MATH 15	Linear Algebra	
or MATH 15	Linear Algebra with Abstract Vector Spaces	
Core E - Social Sciences		
Choose one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
PSYC 1101	General Psychology [3]	3
PSYC 2015	Research Methods [3]	4
Any SS [4]		2
Core F - Courses Related to Major		
BIOS 1107 & 1107L	Biological Principles and Biological Principles Laboratory	4
BIOS 1108 & 1108L	Organismal Biology and Organismal Biology Laboratory	4
Choose two of the following: [3]		6
PSYC 2103	Human Development Over the Life Span	
PSYC 2210	Social Psychology	
PSYC 2230	Abnormal Psychology	
PSYC 2240	Personality Theory	
PSYC 2020	Psychological Statistics [3]	4
Major Requirements		
Choose 8 credits from the following: [3,5,6]		8
PSYC 4011	Cognitive Psychology	
PSYC 4020	Biopsychology	
PSYC 4025	Learning and Memory	
PSYC 4041	Human Sensation and Perception	
PSYC 4031	Applied Experimental Psychology [3]	4
or PSYC 46(	Senior Thesis II	
PSYC Electives		
Choose 15 credits from the following: [2,3]		15
PSYC 2005	Exploring Multicultural Identities	
PSYC 2103	Human Development Over the Life Span	
PSYC 2130	Introduction to Educational Psychology	
PSYC 2210	Social Psychology	
PSYC 2220	Industrial/Organizational Psychology	
PSYC 2230	Abnormal Psychology	
PSYC 2240	Personality Theory	
PSYC 2270	Introduction to Engineering Psychology	
PSYC 2280	Psychology of Creativity and Art	
PSYC 2695	Internship	
PSYC 2699	Undergraduate Research	
PSYC 2760	Human Language Processing	
PSYC 2803	Special Topics	
PSYC 3031	Experimental Analysis of Behavior	
PSYC 3750	Human Computer Interface Design and Evaluation	
PSYC 3790	Introduction to Cognitive Science	
PSYC 3873	Special Topics	
PSYC 4010	Human Abilities	
PSYC 4011	Cognitive Psychology	
PSYC 4020	Biopsychology	
PSYC 4025	Learning and Memory	
PSYC 4041	Human Sensation and Perception	
PSYC 4050	History and Systems	
PSYC 4090	Cognitive Neuroscience	
PSYC 4100	Behavioral Pharmacology	
PSYC 4200	Advanced Topics in Cognitive Psychology	
PSYC 4260	Psychology of Aging	
PSYC 4270	Psychological Testing	
PSYC 4600	Senior Thesis I	
PSYC 4697	Psychology Undergraduate Teaching Experience	
PSYC 4699	Undergraduate Research	
Free Electives		
Free Electives		32
Total Credit Hours		**122**

Pass-fail only allowed for Free Electives.

At least 39 hours of upper division (3000/4000 level) coursework are required.

At least 21 hours of 3000/4000 level psychology courses must be taken summed across major requirements and PSYC electives.

1. CHEM 1211K or CHEM 1212K or CHEM 1310 or PHYS 2211 or PHYS 2212 or PHYS 2231 or PHYS 2232.
2. Maximum of three credit hours of PSYC 2699 or PSYC 4699
3. Minimum grade of C required.
4. The extra hour from Social Science elective may be used to meet free elective hours.
5. If PSYC 4020 (3 credit hour course) is taken for major field requirement choice, then one additional hour of PSYC elective is required.
6. If PSYC 4025 (3 credit hour course) is taken for major field requirement choice, then one additional hour of PSYC elective is required.

BACHELOR OF SCIENCE IN PUBLIC POLICY

The Bachelor of Science in Public Policy (BS PP) provides an education that combines strong analytical skills with understanding of a range of substantive policy issues and the political, social, and cultural forces that shape public policies. The BS PP core courses provide students with the broad political, economic, and philosophical foundations of thought pertinent to public policy, a base of rigorous quantitative and qualitative analytical approaches, and a solid understanding of the political and social dynamics that structure policy debates and policy outcomes.

The curriculum moves from disciplinary foundations (in politics, economics, philosophy, and organization theory) to methods of research and data analysis, and to detailed studies of particular policy problems. Students choose two clusters in environment and energy policy, science and technology policy, social and urban policy, philosophy, or politics and policy, and can select electives in additional areas such as information and telecommunication policy, bioengineering and ethics, and regional development policy. All students have opportunities for internships, research, and study abroad or exchange programs. The BS PP program culminates in a senior-year two-semester capstone "task force" in which students work in teams with outside clients (e.g., Centers for Disease Control, Marcus Autism Center, Multiple Sclerosis Society, Atlanta Food Bank) on actual policy problems.

The program's emphasis on the development of problem-solving and analytical skills constitutes a strong comparative advantage for BS PP graduates, many of whom move on to law school, management consulting, public sector policy analysis, or nonprofit management.

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1712	Survey of Calculus	4
or MATH 15	Integral Calculus	
Core B - Institutional Options		
CS 1315	Introduction to Media Computation	3
Core C - Humanities		
Any HUM		6
Core D - Science, Math, & Technology		
Lab Science		4
Lab Science		4
MATH 1711	Finite Mathematics	4
or MATH 15	Differential Calculus	
& MATH 15	and Introduction to Linear Algebra	
Core E - Social Sciences		
POL 1101	Government of the United States	3
Any SS		9
Core F - Courses Related to Major		
ECON 2106	Principles of Microeconomics	3
PHIL 2025	Philosophical Analysis of Policy Choices	3
PUBP 2010	Political Processes [2]	3
PUBP 2030	Organizations and Policy [2]	3
Science, Computing, or Engineering Elective [1]		6
Major Requirements		
PUBP 3020	Applied Political Economy [2]	3
PUBP 3030	Policy Analysis [2]	3
PUBP 3120	Statistical Analysis for Public Policy [2]	3
PUBP 3130	Research Methods and Problem Solving [2]	3
PUBP 4010	Policy Task Force I [2]	3
PUBP 4020	Policy Task Force II [2]	3
PUBP 2651	Public Policy Internship [2]	3
or PUBP 465	Public Policy Internship	
Clusters		
Students must select nine hours each from two clusters. See Cluster Electives below for options.		18
Non-Major Cluster		
Any POL, PHIL, or PUBP course [2]		3
Free Electives		
Free Electives [3]		17
Total Credit Hours		**122**

Pass-fail only allowed for Free Electives.

1 Must be chosen from the following list: any AE, CEE, ECE, ISYE course, AE 1770/CEE 1770/ME 1770, BC 3630, BIOL 2335, BIOL 2344, BIOL 4755, CHEM 2211, CHEM 2311, CHEM 2312, CHEM 2380, CHEM 3380, COA 6764, CS 6764, CP 4510 , CS 1171, CS 1316, CS 1331, CS 1332, CS 6754/ME 6754, EAS 2420, EAS 2600, EAS 2655, EAS 2750, EAS 4420, EAS 4430, EAS 4450, EAS 4602, ECE 2030, ID 3103, ID 4103, LMC 2700, LMC 2730, LMC 3402, LMC 3710, LMC 6312, ME 2016, MGT 4051, MGT 4058, MUSI 4630, PHYS 2030, PHYS 2213, PHYS 3123, PHYS 3141, PHYS 3266, PHYS 4142, PSYC 2020, PSYC 2270, PSYC 3011, PSYC 3020, PSYC 3031, PSYC 3040, PSYC 3790, PSYC 4010, PSYC 4031, PSYC 4050, PSYC 4090, PSYC 4100, PSYC 4270.

2 Minimum grade of C required.

3 MATH 1111 and MATH 2804 not allowed.

Cluster Electives

Environmental and Energy Policy Cluster

Code	Title	Credit Hours
PHIL 4176	Environmental Ethics	3
PUBP 3315	Environmental Policy and Politics	3
PUBP 3600	Sustainability, Technology, and Policy	3
PUBP 4338	Environmental Impact Assessment	3
PUBP 6300	Earth Systems	3
PUBP 6310	Environmental Issues	3
PUBP 6312	Economics of Environmental Policy	3
PUBP 6314	Policy Tools for Environmental Management	3
PUBP 6326	Environmental Values and Policy Goals	3

PUBP 6330	Environmental Law	3
PUBP 6760	Negotiation and Conflict Management	3

Science and Technology Policy Cluster

Code	Title	Credit Hours
PHIL 3127	Science, Technology, and Human Values	3
PUBP 3502	Information and Communications Technology Policy	3
PUBP 4111	Internet and Public Policy	3
PUBP 4214	Gender, Science, Technology, and Public Policy	3
PUBP 4410	Science, Technology, and Public Policy	3
PUBP 4414	Technology, Innovation, and Policy	3
PUBP 4416	Critical Issues in Science and Technology	3
PUBP 4756	Technology Forecasting and Assessment	3
PUBP 6402	Research Policy and Management	3
PUBP 6415	Technology, Regions, and Policy	3
PUBP 6417	Critical Perspectives on Science and Technology	3
PUBP 6421	Development of Large-scale Socio-technical Systems	3
PUBP 6501	Information Policy and Management	3
PUBP 6740	Innovation, the State and Industrial Development in International Perspecitve	3
PUBP 6741	Geography of Innovation	3
PUBP 6753	Comparative Science and Technology Policy	3
PUBP 6777	Analysis of Emerging Technologies	3

Social and Urban Policy Cluster

Code	Title	Credit Hours
PUBP 3201	Introduction to Social Policy	3
PUBP 3214	African American Politics	3
PUBP 4200	Social Policy Issues	3
PUBP 4211	Urban Policy	3
PUBP 4212	Women and Public Policy	3
PUBP 4214	Gender, Science, Technology, and Public Policy	3
PUBP 6604	Methods of Urban Policy Analysis and Planning	3
PUBP 6606	Urban Development Policy	3

Philosophy Cluster

Code	Title	Credit Hours
PHIL 3102	Ancient Philosophy	3
PHIL 3103	Modern Philosophy	3
PHIL 3105	Ethical Theories	3
PHIL 3109	Engineering Ethics	3
PHIL 3113	Logic and Critical Thinking	3
PHIL 3115	Philosophy of Science	3
PHIL 3127	Science, Technology, and Human Values	3
PHIL 3790	Introduction to Cognitive Science	3
PHIL 4110	Theories of Knowledge	3
PHIL 4174	Perspectives in Science and Technology	3
PHIL 4176	Environmental Ethics	3
PHIL 4752	Philosophical Issues in Computation	3
PHIL 4790	Semi-Cognitive Science	3
PHIL 6010	Biotechnology and Research Ethics	2

Politics and Policy Cluster

Code	Title	Credit Hours
POL 2101	State and Local Government	3
PHIL 3050	Political Philosophy	3
PUBP 1142	Teams and Collaboration	3
PUBP 2142	Teams and Collaboration in Context	3
PUBP 3016	Judicial Process	3
PUBP 3141	Leading Social Organizations	3
PUBP 3214	African American Politics	3
PUBP 3510	Politics and Policy	3
PUBP 4140	Foundations of Leadership	3
PUBP 4226	Business and Government	3
PUBP 4440	Science, Technology, and Regulation	3

BS/MS Public Policy

The School of Public Policy offers a BS/MS program for students enrolled in the undergraduate program who demonstrate an interest in and ability for additional education beyond the BS degree.

Students in the BS/MS program remain undergraduates until they meet requirements for the undergraduate degree, at which point they receive their BS degree and change to graduate status. Students are eligible to apply for the program after completion of 30 semester credit hours at Georgia Tech (i.e., at the end of their first year), and if they show appropriate progress in their degree program thereafter. Admissions decisions will be based on GPA and judgments of the faculty who have served as advisors or instructors. Continuation in the program requires the student to maintain a GPA of 3.0 or higher in public policy courses. Students participating in this program will be eligible for the six semester credit-hour Graduate Course Option, which allows students completing both the bachelor's and master's in the same discipline to use up to 6 credit hours of graduate-level coursework in the major discipline for both degrees.

The graduate-level credits required in the BS/MS Program are usually as follows:

Code	Title	Credit Hours
Core		22
Electives		12
Research Paper		3
Total Credit Hours		**37**

Specific Requirements for the Program

Code	Title	Credit Hours
Required Courses		
PUBP 6001	Introduction to Public Policy	1
PUBP 6010	Ethics, Epistemology, and Public Policy	3
PUBP 6112	Research Design in Policy Science [1]	3

PUBP 3130	Research Methods and Problem Solving	3
PUBP 6114	Applied Policy Methods and Data Analysis	3
PUBP 6116	Microeconomics for Policy Analysis	3
PUBP 6118	Public Finance Policy	3
PUBP 6201	Public Policy Analysis	3
Select one of the following:		3
PUBP 6014	Organization Theory	
PUBP 6017	Public Management	
PUBP 6018	Policy Implementation and Administration	
Concentration		
Concentration [2]		6
Total Credit Hours		**31**

[1] NOTE: This course should be taken as an undergraduate instead of PUBP 3130 and will count for both programs.

[2] Students are required to develop, in consultation with their advisor, a six credit hour concentration in an area or specialty relevant to public policy and management (e.g. environmental policy, science and technology policy, urban policy, economic development, information and communications policy, policy evaluation, public management).

Contact the BS PP program director for further information.

BS/MS Information

BACHELOR OF SCIENCE IN SOLID EARTH AND PLANETARY SCIENCES

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health	2
or APPH 10	The Science of Physical Activity and Health	
or APPH 10	Flourishing: Strategies for Well-being and Resilience	
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
Core B - Institutional Options		
CS 1301	Introduction to Computing	3
or CS 1371	Computing for Engineers	
Core C - Humanities [1]		
Any HUM		6
Core D - Science, Math, & Technology		
PHYS 2211	Introductory Physics I	4
CHEM 1211K	Chemical Principles I	4
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
Core E - Social Sciences [1]		
Select one of the following:		3
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
Any SS		9
Core F - Courses Related to Major		
PHYS 2212	Introductory Physics II	4
MATH 2551	Multivariable Calculus	4
MATH 2552	Differential Equations	4
EAS 1600	Introduction to Environmental Science	4
EAS 2600	Earth Processes	4
Major Requirements		
EAS 2655	Quantitative Techniques in Earth and Atmospheric Sciences	3
EAS 3603	Thermodynamics of Earth Systems	3
EAS 3610	Introduction to Geophysics	3
EAS 4370	Physics of Planets	3
EAS 4200	Structural Geology and Continuum Mechanics	4
EAS 4610	Earth System Modeling	3
EAS 4801	Special Topics (Career Development Seminar)	1
EAS 4814	Special Topics-Lab (Geophysical Field Methods)	4
or EAS 4420	Environmental Field Methods	
SEP Technical Electives		**12**
EAS 4312	Geodynamics	
EAS 4314	Seismology	
EAS 4316	Earthquake Physics	
EAS 4360	Space Physics and Space Instrumentation	
EAS 4375	Earth and Planetary Materials	
EAS 4480	Environmental Data Analysis	
EAS 4520	Seismic Methods in Exploration Geophysics	
EAS 4699	Undergraduate Research	
EAS 4803	Special Topics (Earth Evolution)	
EAS 4803	Special Topics (Ice Sheet Dynamics)	
EAS 4803	Special Topics (Geologic History)	
Upper Division Electives		**12**
Free Electives [1]		**9**
Total Credit Hours		**122**

[1] Pass/Fail allowed only for Humanities, Social Sciences, and Free electives.

DOCTOR OF PHILOSOPHY WITH A MAJOR IN AEROSPACE ENGINEERING

The School of Aerospace Engineering offers a doctoral degree. The PhD degree is a research degree.

For further details governing the graduate program, access the *Aerospace Engineering Graduate Handbook* at www.ae.gatech.edu. Graduate students may specialize in the following areas: aerodynamics and fluid mechanics, aeroelasticity and structural dynamics, flight mechanics and control, propulsion and combustion, structural mechanics and materials behavior, and system design and optimization. Further information on these areas of specialization and research can be found at www.ae.gatech.edu/research.

- 42 hours of letter-grade, formal coursework beyond the BS degree
  - May include up to 30 hours of relevant grad. coursework from an accredited univ.
  - MS courses count toward this total
  - Special Problems credits (e.g. AE8900) do not count toward this total
  - Must be at 4xxx level or above

Includes:

- At least 9 hours of Math
  - Satisfies Institute PhD minor requirement using “Math” courses
  - No more than 6 hours at 4xxx level
  - At leas18 hours of GT AE coursework
  - No more than 6 hours of relevant non-technical courses

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

DOCTOR OF PHILOSOPHY WITH A MAJOR IN ALGORITHMS, COMBINATORICS, AND OPTIMIZATION

One of the most rapidly growing areas of research in applied mathematics, computer science, and operations research has been dealing with discrete structures. This has been most evident in the fields of combinatorics, discrete optimization, and the analysis of algorithms. Increasingly, work in each of these subjects has come to depend on knowledge of all of them. Indeed, many of the most significant advances have resulted from the efforts of researchers in more than one, if not all three, of these areas.

In response to these developments, Georgia Tech has introduced a doctoral degree program in Algorithms, Combinatorics, and Optimization (ACO). This multidisciplinary program is sponsored jointly by the School of Mathematics, the School of Industrial and Systems Engineering, and the College of Computing. Faculty for the program are drawn from these three sponsoring units, as well as from the School of Electrical and Computer Engineering and the College of Business.

The ACO program is arranged to bring together the study of discrete structures and the design and analysis of algorithms in areas such as graph theory, integer programming, combinatorial optimization, and polyhedral theory. It is intended for students possessing a strong background in one or more of the fields represented by the three sponsoring units. Each student in the program has a single home department chosen from the School of Mathematics, the School of Industrial and Systems Engineering, and the College of Computing. Courses for the program are drawn from all three of these units, and include study in such areas as combinatorial methods, algebraic structures, probability, the analysis of algorithms, computational complexity, linear programming, discrete optimization, and convex analysis.

The College of Computing is one of the sponsors of the multidisciplinary program in Algorithms, Combinatorics, and Optimization (ACO), an approved doctoral degree program at Georgia Tech. The other sponsoring units are the Stewart School of Industrial and Systems Engineering and the School of Mathematics. The degree program is administered by an oversight committee drawn primarily from the sponsoring units.

The study of discrete structures is a rapidly growing area in computer science, applied mathematics, and operations research, most obviously in the analysis of algorithms, combinatorics, and discrete optimization. Collaborative work among the three traditionally separate disciplines is already common. The doctorate in Algorithms, Combinatorics, and Optimization will prepare students for careers in this exciting and expanding field.

Students are expected to be well prepared in at least one of the three fields represented by the sponsoring units (computer science, mathematics, and operations research). Each student in the program is admitted through one of the three sponsoring units, which serves as the home department. Coursework is drawn from all three disciplines. The research advisor may be any member of the ACO program faculty, which is drawn from electrical and computer engineering, management, and other disciplines in addition to the three sponsoring units.

PhD A.C.O. Information

Regardless of the home department, each ACO student must complete the ACO core courses. At least 15 hours of course work beyond the program core must also be completed; some of these additional courses are specified by the student's home department. All required courses must be passed with a grade of B or higher. Other requirements include the minor field of study, passing the comprehensive examination, defending a research proposal, and successful defense of the dissertation.

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

Code	Title	Credit Hours
Core Courses		
CS 6550	Design and Analysis of Algorithms	3
CS 6505	Computability, Algorithms, and Complexity [1]	3
or CS 6520	Computational Complexity Theory	
ISYE 7661	Theory of Linear Inequalities	3
ISYE 7686	Advanced Combinatorial Optimization	3
MATH 6014	Graph Theory and Combinatorial Structures	3
MATH 6121	Modern Abstract Algebra I [2]	3
MATH 7018	Probabilistic Methods in Combinatorics	3
Total Credit Hours		**21**

[1] School of Computer Science students must select CS 6520
[2] Industrial and Systems Engineering students may substitute MATH 6112

Additional Course Requirements

Each student must complete at least 15 hours of course work at the 6000-level or higher in addition to the core courses. The following courses are required, depending on the student's home department

Code	Title	Credit Hours
School of Computer Science		
Two theory courses at the leve of 7000 or above		
School of Industrial and Systems Engineering		
ISYE/MATH 6761	Stochastic Processes I	3
ISYE 6663	Nonlinear Optimization	3
School of Mathematics		
MATH 6337	Real Analysis I	3
Two courses selected from:		
MATH 6321	Functions of a Complex Variable I	3
MATH 6112	Advanced Linear Algebra	3
A 6000-level or above topology/geometry course		

DOCTOR OF PHILOSOPHY WITH A MAJOR IN APPLIED PHYSIOLOGY

The School of Biological Sciences offers a multidisciplinary and integrative PhD program in Applied Physiology focused on the study of human movement and mobility, with research concentrations in biomechanics, neuromechanics, motor control and behavior, muscle cellular and systems physiology, and exercise physiology. Applied physiology refers to the study of normal and abnormal regulation and integration of mechanisms across all levels of biological organization (molecules to cells to organs to organ systems). The course of graduate study focuses on original, independent research culminating in the doctoral dissertation.

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

All students are required to complete the following:

Code	Title	Credit Hours
Core Coursework [1,2]		
APPH 6240	Cellular Physiology and Adaptation	3
APPH 6241	Neuromotor Physiology	3
APPH 6242	Integrative Physiology	3
APPH 6225	Biostatistics	3
APPH 8000	Seminar	3
PHIL 6000	Responsible Conduct of Research (RCR) [3]	1
Minor [4]		**9**
Focus Area [5]		**6**
Dissertation [6]		**12**
Total Credit Hours		**43**

A maximum of 3 credit hours of Special Problems and 6 hours of 4000 level courses may be counted toward PhD course requirements.

1. Core coursework must be completed on a letter grade basis within first two years of graduate study.
2. Students must satisfactorily complete all course courses before they are eligible to take the oral qualifying examination.
3. Complete PHIL 6000 or a program's 'in-house' training approach http://rcr.gatech.edu/doctoral-courses within 90 days of first semester as PhD student. RCR training is mandatory for all PhD students
4. Must be approved by advisor and must be non-APPH courses taken for letter grade
5. Must be approved by advisor, completed for letter grade. A maximum of 3 hours of 4000-level coursework may apply. No Special Problems hours may apply.
6. Twelve (12) hours is the minimum required for the PhD. Typical accrued hours will be between 40-80 hours.

CORE COURSEWORK

The AP Graduate Committee will review any petitions to exempt these courses based on equivalent work. Students may begin taking elective courses approved by their faculty advisor prior to completion of these core classes.

MINOR FIELD OF STUDY

As per Georgia Tech guidelines, in addition to adequate knowledge in their major field of intended research, the student must demonstrate mastery of another body of knowledge – the minor field, preferably outside the student's school. The purpose of the minor is to encourage a more diverse interest on the part of the student and to provide a broader basis for the evaluation of their capabilities. The minor field of study will consist of at least 9 credit hours of work in related courses, agreed upon by both the student and their advisor. Once the student has satisfactorily completed the minor requirement as required by the Institute, the appropriate form (download from the Georgia Tech website) must be completed in the School office with a copy sent to the Office of Graduate Studies for final approval and recording prior to graduation. Minor field of study courses must be completed on a letter grade basis and should include non-APPH courses. The courses should be at the 6000 level or above, but use of certain 4000 level courses may be appropriate.

FOCUS AREA

In addition to the core courses (15 credit hours) and the minor (9 credit hours), each student is required to take 6 credit hours in their focus area (for example, biomechanics). These courses must be approved by the student's advisor. A maximum of 3 hours of 4000 level courses can apply to the focus area. No Special Problems hours can apply to the Focus area. Focus area courses must be completed on a letter grade basis.

DISSERTATION HOURS

In addition, registration for Doctoral Dissertation hours (APPH 9000) should begin with the student's initial term and continue throughout doctoral study. Dissertation hours are broadly interpreted to reflect all stages of the doctoral dissertation – literature review, topic selection, experimental/theoretical preparation, research performance, writing and presentation. In consultation with their advisor, first year students will be advised to register for only a few hours of APPH 9000 (e.g., 3-6 hours). In contrast, advanced doctoral students who are working primarily on their dissertation research should register for 18 or more hours in fall and spring semesters and for up to 16 hours of APPH 9000 for summer semesters. Full time doctoral students are expected to commit to an intensive research program, and should register for thesis hours to reflect maximal effort. Students should register for the maximum 21 hours each semester by filling out their schedule with APPH 9000 Dissertation

DOCTOR OF PHILOSOPHY WITH A MAJOR IN ARCHITECTURE

The program leading to the Doctor of Philosophy degree in the College of Design has been developed to enable students of exceptional ability to undertake advanced study and original research in the fields of study within the College of Design. Currently the program includes several areas of research emphasis:

1. Design Computation
2. Building Design Technology
3. History, Theory, Criticism
4. Architecture, Culture and Behavior
5. Urbanism

Design Computation

Digital-based information technologies have profoundly affected architectural discourse and practice. New types of representation and manufacturing, emergent materials and technologies, innovating modes of collaboration and project delivery, all constitute a profoundly new discourse that has revolutionized the ways architects design, think and talk about architecture, design and buildings. The Design Computation area addresses this emergent all encompassing computational basis for architectural design by inquiring on a variety of related sub-areas including generative and parametric design, digital fabrication, prototyping and robotics, building information modeling (BIM), immersive visualization and virtual reality, databases and user interfaces, formal specification of shape and style, and computer implementation of analytical and design tools. The work draws upon relations with other disciplines at Georgia Tech including allied fields within the College of Design as well as the Colleges of Computing, Engineering, Sciences, Business, and the Liberal Arts.

Building Design Technology

The Ph.D. specialization in Building Design Technology, advances the use of building physics, building technology, mathematics, controls, modeling, and simulation for the design and operation of high-performing buildings. The technical performance of buildings is the result of the complex interplay of highly variable boundary conditions with the physical behavior of many components operating in multiple domains. The capture of this interplay at appropriate resolution and aggregation with subsequent use in design and operational decisions is the major focus of our work. Research results generate new building performance knowledge in fields such as energy, sustainability, comfort, health, day-lighting, productivity and other performance aspects.

History, Theory, Criticism

The Ph.D. specialization in Architecture History, Theory, Criticism, promotes critical and scholarly reflection in architecture and urban design, with a special focus on issues linking theory and practice. Ongoing work extends a distinguished record of faculty and alumni scholarship in the field based upon the unique range of disciplines and professions available within the College of Design and Georgia Tech. While highlighting modern and contemporary architecture, faculty interests vary significantly by subject area, period, region, and methodological emphasis. These continuously evolving interests are dedicated to understanding the built environment as a form of cultural production. In different ways and with various techniques, faculty contribute to a growing field of cross-cultural studies and interdisciplinary scholarship that use rigorous concepts from humanistic, social scientific, and technical disciplines often considered to be outside the purview of architectural history and theory, to better understand the material, spatial, and intellectual dimensions of the physical world.

Architecture, Culture, Behavior

The field of Architecture, Culture, Behavior, explores how individual, social, organizational, and cultural behavior, performance, and experience relate to the design of buildings and urban space. We develop tools and methods to describe and quantify the properties of built form, model performance and evaluate design and their impacts on individual experience and organizational functioning. Underlying themes of inquiry include spatial cognition; the relationship between built space and social networks; the relationship between built space and the morphology of behaviors; the evolution of building types in relation to the changing programmatic requirements of their occupant organizations; the perceptual and functional implications of design languages. Particular studies explore a range of built environments: healthcare facilities that support higher quality care; workplace design that supports organizational culture and productivity; museum design that supports informal learning; urban design that supports active and vibrant communities.

Urbanism

Research into Urbanism seeks to understand how we shape our cities to provide the highest quality of life, share resources equitably, promote ecological performance and address unprecedented 21st century challenges. Highly collaborative researchers in urbanism partner with sponsors around the planet and colleagues across Georgia Tech - especially those in the School of Civil and Environmental Engineering and School of City and Regional Planning.

For further details on the program, contact:

Robin Tucker, Academic Advising Manager

robin.tucker@design.gatech.edu

404-894-1213
Website: www.arch.gatech.edu/

Architecture PhD Information

PhD in Architecture: Major Program Requirements and Key Milestones

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

Course Work Associated with the Major

In their first two years, students earn a minimum of thirty credits in the School of Architecture, as follows:

Code	Title	Credit Hours
Core courses on Introduction to Architecture Research		6
Select Five 3-credit courses in an area of research specialization within the School.		12

Select an additional 12 credits at the 6000 level and above chosen in consultation with the advisor.	12
Total Credit Hours	**30**

Qualifying Paper

In the second year of their studies students complete a qualifying paper, a paper of publishable standard that makes a contribution to knowledge. A minimum of 6 hours of ARCH 8799 is required.

Comprehensive Examination in the Architecture Major

At the end of the second year of their studies students take a comprehensive examination covering both the core curriculum and their area of specialization.

Thesis Topic Proposal

In their third year of studies students are expected to defend a PhD topic proposal. Upon successful defense of the proposal they are admitted to candidacy and proceed to work on their doctoral theses. The development of a thesis topic normally requires students to register for at least six credits of ARCH 8999.

Minor Field of Study

Students satisfy the minor by taking nine credit hours in related courses 6000 level and above, in a field of studies outside the School of Architecture to be determined in consultation with their faculty advisor.

Doctoral Thesis

The preparation of a Doctoral thesis normally requires a minimum of 6 credits ARCH 9000. The defense of the doctoral thesis is the final step in the program. A successful defense results in the student being recommended for the award of the PhD degree.

Time to Completion of degree

We strive to ensure that the average time required to complete the PhD degree is no longer than four years. However, students who teach or work as GRAs, particularly those who seek to build a strong record of research, publications and teaching, sometimes take longer.

DOCTOR OF PHILOSOPHY WITH A MAJOR IN BIOENGINEERING

The BioE Program is interdisciplinary in that it is not a standalone academic unit like most departments or schools at Georgia Tech. This interdisciplinary graduate program offers advanced courses in bioengineering, engineering specialties, and life sciences combined with training in cutting-edge bioengineering research. The Bioengineering PhD degree requires a thesis based on independent study of a bioengineering research topic under the guidance of a bioengineering program faculty member. Bioengineering research focuses on the development of new or improved physical and mathematical concepts and techniques that may be applied to problems in medicine and biology, including the fundamental study of biological phenomena and development of new medical devices.

Eight different academic units from the Colleges of Engineering, Computing, and Design make up the program. The BioE Program provides research opportunities for students with any participating program faculty, allowing tremendous diversity and flexibility for research topics and advisors.

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

Requirements for the Doctor of Philosophy with a major in Bioengineering

Code	Title	Credit Hours
Qualifying Examinatin		
Teaching Practicum		
Thesis Proposal		
PhD Dissertation		
Coursework requirements		

PhD students in BioEngineering must complete course requirements with an average cumulative GPA of 3.2 or higher. PassFail hours not allowed.

Code	Title	Credit Hours
Coursework Requirements		
Engineering Fundamentals		9
Biological Sciences		9
Engineering Mathematics		3
Technical Electives		12
Doctoral Minor		9
Total Credit Hours		**42**

Qualifying Exam

The qualifying exam is a 1.5 to 2 hour oral exam consisting of questioning from a committee of three BioEngineereing faculty. PhD students must take the qualifying exam after 3 academic semesters of residency (excluding summers), except those students entering with a master's degree must take the qualifying exam within 2 academic semesters. Students must have a GPA of 3.2 to take their qualifying exam. Students who do not pass the exam the first time have a second opportunity to take and pass the exam within the following 3 months.

Teaching practicum

The purpose of the practicum is to provide the student with training and experience in teaching a course. The student will work with a BioE faculty member on all aspects of teaching a course, including:
– delivering lectures or managing discussion sessions
– holding office hours
– helping to prepare and grade assignments
The instructing faculty member must attend the student's lectures and provide feedback.
PhD students must also satisfy any related home school requirements.

Thesis proposal

A student must provide a cohesive research plan addressing a significant problem and obtain input and approval from their thesis committee on the proposed research plan via an oral defense of their thesis proposal. The proposal should include a critical review of the relevant literature, a cohesive set of specific aims, hypothesis, and expected outcomes addressing thesis topic, and an appropriate research design and plan.

PhD Dissertation

A student must complete a searching and authoritative investigation of their chosen field, culminating in a written Thesis covering that investigation. An oral defense will be scheduled on the subject matter for the Thesis and the field in which it lies. The thesis defense examination will be conducted by the Doctoral Examination Committee chosen by the student and the thesis advisor and approved by the Graduate Studies Committee and the Dean of Graduate Studies.

Code	Title	Credit Hours
Engineering Fundamentals		
AE 6760	Acoustics I	3
AE 6762	Applied Acoustics	3
AE 6766	Combustion	3
AE 6770	Energy and Variational Methods in Elasticity and Plasticity	3
AE 7772	Fundamentals of Fracture Mechanics	3
CEE 6251	Intermediate Fluid Mechanics	3
CEE 6504	Finite Element Method of Structural Analysis	3
CEE 7772	Fundamentals of Fracture Mechanics	3
CHBE 6100	Advanced Chemical Engineering Thermodynamics	3
CHBE 6200	Advanced Transport Phenomena, Fluid Mechanics, and Heat	3
CHBE 6220	Computational Fluid Dynamics: Applications in Environmental	3
CHBE 6250	Mass Transport through Solids	3
CHBE 6260	Transport Phenomena-Mass Transfer	3
CHBE 6300	Kinetics and Reactor Design	3
CHBE 6400	Advanced Process Control	3
CHBE 6768	Polymer Structure, Physical Properties and Characterization	3
CHBE 7772	Fundamentals of Fracture Mechanics	3
CHEM 6751	Physical Chemistry of Polymer Solutions	3

CS 6230	High-Performance Parallel Computing: Tools and Applications	3
CS 7641	Machine Learning	3
CS 7643	Deep Learning	3
ECE 4270	Fundamentals of Digital Signal Processing	3
ECE 4580	Computational Computer Vision	3
ECE 6130	Advanced VLSI Systems	3
ECE 6250	Advanced Digital Signal Processing	3
ECE 6254	Statistical Machine Learning	3
ECE 6255	Digital Processing of Speech Signals	3
ECE 6258	Digital Image Processing	3
ECE 6273	Methods of Pattern Recognition with Application to Voice	3
ECE 6350	Applied Electromagnetics	3
ECE 6360	Microwave Design	3
ECE 6370	Electromagnetic Radiation and Antennas	3
ECE 6380	Introduction to Computational Electromagnetics	3
ECE 6412	Analog Integrated Circuit Design	3
ECE 6414	Analog Integrated System Design	3
ECE 6435	Neuromorphic Analog VLSI Circuits	3
ECE 6442	Electronic Oscillators	3
ECE 6450	Introduction to Microelectronics Technology	3
ECE 6451	Introduction to the Theory of Microelectronics	3
ECE 6453	Theory of Electronic Devices	3
ECE 6460	Microelectromechanical Devices	3
ECE 6500	Fourier Techniques and Signal Analysis	3
ECE 6501	Fourier Optics and Holography	3
ECE 6520	Integrated Optics	3
ECE 6522	Nonlinear Optics	3
ECE 6542	Optoelectronics: Devices, Integration, Packaging, Systems	3
ECE 6550	Linear Systems and Controls	3
ECE 6552	Nonlinear Systems and Control	3
ECE 6553	Optimal Control and Optimization	3
ECE 6554	Adaptive Control	3
ECE 6556	Intelligent Control	3
ECE 6560	Partial Differential Equations in Image Processing and Computer Vision	3
ECE 6605	Information Theory	3
ECE 6606	Coding Theory and Applications	3
ECE 6771	Optoelectronics: Materials, Processes, Devices	3
ECE 6779	Thermal Engineering for Packaging of Micro and Nano Systems	3
ECE 7252	Advanced Signal Processing Theory	3
ISYE 6215	Models in Human-Machine Systems	3
ISYE 6223	Understanding and Supporting Human Decision Making	3
ISYE 6234	Measurement and Evaluation of Human-integrated Systems	3
ISYE 6650	Probabilistic Models and Their Applications	3
ISYE 6669	Deterministic Optimization	3
ME 6124	Finite-Element Method: Theory and Practice	3
ME 6201	Principles of Continuum Mechanics	3
ME 6203	Inelastic Deformation of Solids	3
ME 6204	Micromechanics of Materials	3
ME 6229	Introduction to Micro-Electro-Mechanical Systems	3
ME 6242	Mechanics of Contact	3
ME 6301	Conduction Heat Transfer	3
ME 6302	Convection Heat Transfer	3
ME 6303	Thermal Radiation Heat Transfer	3
ME 6304	Principles of Thermodynamics	3
ME 6305	Applications of Thermodynamics	3
ME 6401	Linear Control Systems	3
ME 6402	Nonlinear Control Systems	3
ME 6403	Digital Control Systems	3
ME 6405	Introduction to Mechatronics	3
ME 6407	Robotics	3
ME 6441	Dynamics of Mechanical Systems	3
ME 6442	Vibration of Mechanical Systems	3
ME 6443	Variational Methods in Engineering	3
ME 6449	Acoustic Transducers and Signal Analysis	3
ME 6452	Wave Propagation in Solids	3
ME 6601	Introduction to Fluid Mechanics	3
ME 6602	Viscous Flow	3
ME 6622	Experimental Methods	3
ME 6760	Acoustics I and II	3
ME 6762	Applied Acoustics	3
ME 6766	Combustion I	3
ME 6768	Polymer Structure, Physical Properties, and Characterization	3
ME 6769	Linear Elasticity	3
ME 6770	Energy and Variational Methods in Elasticity and Plasticity	3
ME 6779	Thermal Engineering for Packaging of Micro and Nano Systems	3
ME 6796	Structure-Property Relationships in Materials	3
ME 7751	Computational Fluid Mechanics	3
ME 7771	Mechanics of Polymer Solids and Fluids	3
ME 7772	Fundamentals of Fracture Mechanics	3
ME 7774	Fatigue of Materials and Structures	3
MSE 6130	Surface Analysis	3
MSE 6751	Physical Chemistry of Polymer Solutions	3
MSE 6752	Polymer Characterization	4
MSE 6768	Polymer Structure, Physical Properties, and Characterization	3
MSE 6796	Structure-Property Relationships in Materials	3
MSE 7772	Fundamentals of Fracture Mechanics	3
PTFE 6100	Mechanics of Fibrous Materials	3
PTFE 6751	Physical Chemistry of Polymer Solutions	3
PTFE 6768	Polymer Structure, Physical Properties, and Characterization	3
PTFE 6796	Structure-Property Relationships in Materials	3

Code	Title	Credit Hours
Biological Sciences		
APPH 6211	Systems Physiology I: Cellular Mechanisms of Plasticity	3
APPH 6212	Systems Physiology II: Physiology of Neuromotor Tissues	3
APPH 6231	Biomechanical Aspects of Human Motor Control	3
APPH 6232	Locomotion Neuromechanics	3
APPH 6600	Muscle Structure and Plasticity	3
APPH 6213	Systems Physiology III: Integrated Systems and Adaptation	3
BIOL 6418	Microbial Physiology	3
BIOL 6570	Immunology	4
BIOL 6600	Evolution	3
BIOL 6626	Physiological Ecology	3
BIOL 6756	Discovery of Signaling Molecules	3
BIOL 7001	Foundations in Molecular and Cell Biology	4
BIOL 7668	Eukaryotic Molecular Genetics	3
BMED 4752	Introductory Neuroscience	3
BMED 6031	Principles of Basic Biomedical and Biological Sciences I	6
BMED 6032	Principles of Basis Biomedical and Biological Sciences II	6
BMED 6042	Systems Physiology	3
BMED 6793	Systems Pathophysiology	3
CHEM 6183	Organometallic Chemistry	3
CHEM 6373	Organic Synthesis	3
CHEM 6501	Biochemistry I	3
CHEM 6502	Biochemistry II	3
CHEM 6571	Enzymology and Metabolism	3
CHEM 6572	Macromolecular Structure	3
CHEM 6573	Molecular Biochemistry	3
CHEM 6582	Biophysical Chemistry	3
ME 6793	Systems Pathophysiology	3
Emory Courses:		
IBS 506	Basics of Neurological Diseases	
IBS 518	Human Embryology	
IBS 519	Foundations in Developmental Biology	
IBS 524	Cancer Biology	
IBS 526	Cellular and Developmental Neuroscience	
IBS 527	Cell Biology and Histology	
IBS 531	Principles of Pharmacology	
IBS 536	Drug Metabolism and Toxicology	
IBS 542	Concepts of Immunology	
IBS 548	Biology of the Eye	
IBS 600	Blood and Water	
IBS 761	Cancer Pharmacology	

Code	Title	Credit Hours
Engineering Mathematics		
CHBE 6500	Mathematical Modeling and Analysis of Chemical Processes	3
ECE 6601	Random Processes	3
MATH 6267	Multivariate Statistical Analysis	3
MATH 6646	Numerical Methods for Ordinary Differential Equations	3
MATH 6701	Math Methods of Applied Sciences I	3
PHYS 6268	Nonlinear Dynamics and Chaos	3

Code	Title	Credit Hours
Technical Electives		
AE 6230	Structural Dynamics	3
APPH 6202	Clinical Gait Analysis	3
APPH 6225	Biostatistics	3
BIOL 7015	Cancer Biology and Technology	3
BIOL 7023	Bioinformatics	3
BMED 4750	Diagnostic Imaging Physics	3
BMED 4783	Introduction to Medical Image Processing	3
BMED 4784	Engineering Electrophysiology	3
BMED 6517	Machine Learning in Biosciences	3
BMED 6700	Biostatistics	3
BMED 6710	Rational Design of Biomaterials	3
BMED 6720	Biotransport	3
BMED 6739	Medical Robotics	3
BMED 6743	Tissue Mechanics	3
BMED 6774	Biomaterials: Structure and Function	3
BMED 6780	Medical Image Processing	3
BMED 6782	Cellular Engineering	3
BMED 6784	Cardiovascular Biomechanics	3
BMED 6786	Medical Imaging Systems	3
BMED 6786	Medical Imaging Systems	3
BMED 6787	Quantitative Electrophysiology	3
BMED 6794	Tissue Engineering	3
BMED 7201	Advanced Seminar: Cardiovascular Biology & Biomechanics	3
BMED 7413	Biochemical Systems Analysis	3
BMED 7610	Quantitative Neuroscience	3
CEE 6345	Sustainable Engineering	3
CHBE 6710	Microfluidics & Appl	3
CHBE 6752	Polymer Characterization	4
CHBE 6765	Drug Design, Development and Delivery	3
CHBE 6777	Advanced Biomaterials	3
CHBE 6782	Cellular Engineering	3
CHBE 6794	Tissue Engineering	3
CHBE 8803	Special Topics (Biosurfaces)	3
CHEM 6750	Preparation and Reaction of Polymers	3
CS 7643	Deep Learning	3
ECE 4781	Biomedical Instrumentation	3
ECE 4782	Biosystems Analysis	3

ECE 4784	Engineering Electrophysiology	3
ECE 6200	Biomedical Applications of Microelectromechanical Systems	3
ECE 6780	Medical Image Processing	3
ECE 6786	Medical Imaging Systems	3
ECE 6787	Quantitative Electrophysiology	3
ISYE 6413	Design and Analysis of Experiments	3
ISYE 6414	Statistical Modeling and Regression Analysis	3
ISYE 7406	Data Mining and Statistical Learning	3
ME 6743	Tissue Mechanics	3
ME 6746	Rehabilitation Engineering	3
ME 6777	Advanced Biomaterials	3
ME 6782	Cellular Engineering	3
ME 6794	Tissue Engineering	3
MP/NRE 4750	Diagnostic Imaging Physics	3
MSE 6600	Advanced Polymer Processing	3
MSE 6752	Polymer Characterization	4
MSE 6777	Advanced Biomaterials	3
PHYS 6268	Nonlinear Dynamics and Chaos	3
PTFE 6750	Preparation and Reactions of Polymers	3
Emory course:		
IBS 534	Computational Neuroscience	

DOCTOR OF PHILOSOPHY WITH A MAJOR IN BIOINFORMATICS

Participating Schools

- College of Computing
- School of Biological Sciences
- School of Biomedical Engineering
- School of Chemistry and Biochemistry
- School of Industrial and Systems Engineering
- School of Mathematics

Objective of the Program

The mission of the Georgia Tech Bioinformatics Ph.D. Program is to educate and prepare graduate students to reach the forefront of leadership in the field of bioinformatics and computational biology; and to integrate research and education on the use of information technologies in biology and medicine. Thus, the program leading to a PhD in Bioinformatics is an interdisciplinary program spanning a variety of academic departments at Georgia Tech.

Bioinformatics is a multidisciplinary field in which life sciences, computer science, physical sciences, and engineering are merged to solve both fundamental and applied problems in biology and medicine. The outcomes of bioinformatics and computational biology particularly include:

- new and global perspectives into the organization and function of biological systems (fundamental biology);
- new and novel targets for drug discovery and development; and
- genetic/proteomic profiling for pharmaco-genomics or personalized medicine.

Thus, bioinformatics is emerging as a strategic discipline at the frontier between Biology, Biochemistry, Biomedicine, Bioengineering, Computer Science and Mathematics, impacting fundamental science, medicine, biotechnology, and society.

With its broad mission statement, this program at Georgia Tech has the following focus / strength areas:

- Development of software tools, algorithms, and databases for gene identification, protein structural prediction, clustering analysis, and data mining.
- Application of bioinformatics to disease diagnosis, classification, prognosis, and treatment.
- Application of bioinformatics to fundamental biology and systems biology.

PhD Bioinformatics

PhD Curriculum

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

The requirements for each student in the PhD program in Bioinformatics include the successful completion of a set of core courses in Biology, Biochemistry, Mathematics, and Computer Science, while the main emphasis of the program is on the successful completion of an original and independent research project. Each student must also complete a minor program of study in accordance with Institute policies.

Admission to candidacy requires passing written and oral comprehensive examinations administered by the Bioinformatics PhD Graduate Committee (see the Qualifying Exams section below). The PhD dissertation written on results of the individual research project should provide evidence that the PhD candidate is ready to start an independent research career. The PhD thesis should be defended publicly and approved by the thesis committee.

Each student regardless of home unit is required to complete course work from the following categories. Specific courses should be selected in consultation with the student's faculty advisor, committee, and the Bioinformatics program director. Recommended courses may be found here: https://bioinformatics.gatech.edu/recommended-courses.

A. 9 credit hours of Bioinformatics and Computational Bioscience (e.g. BIOL 6150, BIOL 7200, BIOL 7210)

B. 9 credit hours in Biology, Biochemistry or Biomedical Engineering (e.g. BIOL 7015, BMED 6517, BIOL 8803)

C. 9 credit hours of Mathematics and Computer Science (e.g. CS 7641, CSE 6242, MATH 6702)

D. 9 credit hours of courses in an approved minor

E. 24 research credit hours

Credit hours for courses in categories A, B, and C could be completed by previous graduate study (such as study in the Georgia Tech Master's Degree in Bioinformatics program). Approval of transfer of credits from courses taken elsewhere is done by the Bioinformatics graduate committee. Typically, 2/3 of credit hours in each category A, B, C, D should be at 6000 or higher level. Students can use appropriate 4000 level courses from the list of recommended courses (see separate tab), if the student's thesis committee approves them and include them into a program of study. A student must maintain a GPA of 3.2 in his/her course work.

Participating Schools may have additional requirements and policies for students registered for the Bioinformatics PhD program in that School as the home unit, such as a requirement that courses in sections B or C must be taken in the home department, and/or specifics on affiliation of thesis committee members. These further define the course of study, but do not constitute additional academic workload.

Please **download** the pdf. below to complete the PhD Program of Study form:

Program of Study Bioinformatics.pdf

QUALIFYING EXAMS

The student must successfully pass a qualifying exam, preferably within 24 months after entering the PhD program. The exam consists of written and oral parts. The written part is a written proposal of the planned PhD dissertation research, in the format of a research grant proposal. The oral examination is a presentation of this written thesis proposal. The written exam in Bioinformatics and the oral exam are administered by a faculty committee consisting of:

- Two Bioinformatics Program faculty
- One faculty member from the Home Unit
- Thesis advisor as an observer, not as a participant (as a rule).

The committee is suggested by the advisor and approved jointly by the Chair of the Bioinformatics Graduate Committee and the Chair of a Home Unit Graduate Committee.

The guidelines of the qualifying exam are given as an example and not as a strict guideline to follow by each home unit. Each home unit is allowed to modify the qualifying exam policy to make it most suitable to the unit profile.

Students who wish to transfer to the Bioinformatics program after passing their qualifying exam in another PhD major can be admitted by the Bioinformatics Graduate committee without the requirement of passing the Bioinformatics qualifying exam. In this case the advisor (with co-advisor) and thesis committee may have to specify additional courses to be taken to satisfy the requirements of the program of study.

Home Unit approval for degree petition, as well as approval by the Bioinformatics Graduate Committee, will be required.

THESIS

A student should choose a thesis advisor (from the Bioinformatics Program Faculty) and co-advisors within the first year of being in the PhD program. In the second year a student along with his advisor are expected to assemble the thesis committee. The thesis committee should consist of a minimum of five faculty members. At least three members of the committee should be from Bioinformatics Program Faculty and at least two members of thesis committee should be from the home unit. Not later than in the middle of the third year a student must present and defend a written PhD proposal.

RESEARCH PROGRESS

A student should meet with his/her thesis committee at least once a year to review the research progress.

PhD DISSERTATION

Within 5 years after entering the PhD program, the student is expected to complete the thesis research, and, typically, the student must have the results of the research published in peer reviewed journals. Upon submitting a written thesis and public defense and approval by the committee, the student is awarded the PhD degree.

DOCTOR OF PHILOSOPHY WITH A MAJOR IN BIOLOGY

Each PhD student will acquire a thorough knowledge of a selected area of specialization, a broad knowledge of the field, and competence in the basic sciences. The main emphasis is on the successful completion of an original and independent research project. The purpose of our PhD program is to prepare highly qualified scientists who have excellent, up-to-date training, who are actively involved in scientific research, are capable of making significant contributions to their scientific field, possess all the necessary skills for effective oral and written communication with colleagues, and can successfully compete in the job market for postdoctoral and research scientist level positions in academia, science-related industries, and a wide range of other careers.

Biology Graduate Programs Website

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

Code	Title	Credit Hours
BIOL 9000	Doctoral Thesis	18
BIOL 8002 & BIOL 8003	Seminar and Seminar	2
BIOL 8106	Tools of Science Seminar	2
Coursework (letter grade) approved by thesis committee [1,2,3]		18
Total Credit Hours		**40**

1 At least 9 of the 18 hrs must be graduate courses (6000 level or higher) with a letter grade

2 At least 9 of the 18 hrs must be Biology courses (BIOL 4XXX – 8XXX), with a letter grade

3 9 of the 18 hrs must fulfill the requirement for an approved minor

DOCTOR OF PHILOSOPHY WITH A MAJOR IN BIOMEDICAL ENGINEERING

The Joint Biomedical Engineering PhD program is offered through the Wallace H. Coulter (WHC) Department of Biomedical Engineering at Georgia Tech and Emory University. The degree is conferred jointly by Georgia Tech and Emory. The curriculum is based on an integration of life sciences, engineering, and mathematics. The goal is to enable students to postulate and solve biomedical problems quantitatively and with a systems perspective. Both Georgia Tech and Emory faculty provide an integrative teaching medium for students by team teaching courses.

The curriculum will facilitate individual flexibility and depth of study through coursework selected by the student (and thesis advisor) in specific categories: BME Integrative Core, Bioscience/Data Science/ Engineering Fundamentals, and BME Advanced Graduate Seminar. Other requirements include a bioethics course, a teaching course, a teaching practicum, and a nine-hour minor program of study outside the student's thesis research area. The resulting total minimum number of required hours is 35. It is anticipated (although not required) that students may take other elective coursework to fulfill the requirements of their individual research projects and/or training grants.

Soon after enrollment, students are matched with a thesis advisor based upon mutual interest. After successfully passing the qualifying examination, students submit a request for approval of their Thesis Reading Committee. Upon successful completion of all degree requirements, students will be awarded the PhD degree by the graduate schools of Georgia Tech and Emory.

Minimum Prerequisites

BS in Engineering or Life Sciences
One year of calculus-based physics
One semester of organic chemistry (two semesters recommended)
Calculus through differential equations

Biomedical Information

The curriculum will facilitate individual flexibility and depth of study through coursework selected by the student and thesis advisor.

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

The below table provides an overview of the BME curriculum by category and hours required.

Code	Title	Credit Hours
Integrative Core Series (select one):		**3**
BMED 7011	Integrative Core: Introduction to Modeling and Experimentation in Biomedical Engineering	
BMED 7012	Integrative Core: Experimental Design-Measurements at the Right Spatial and Temporal Scales	
BMED 7013	Integrative Core: Problem Solving with Computational Models	
Bioscience/Engineering/Data Science Fundamentals		**21**
Advanced Graduate Seminar		**3**
Ethics, Teaching, and Professional Development Training Courses		**3**
ETHICS		
JPE 600	Jones Program in Ethics (Emory Course)	
JPE 610	Jones Program in Ethics (Emory Course)	
BMED 7004	Teaching & Research Practicum I	1
PROFESSIONAL DEVELOPMENT TRAINING		
TATTO (Emory) or Georgia Tech TA Orientation		
BMED 7001	Biomedical Engineering Seminar	1
BMED 7004	Teaching & Research Practicum I	1
BMED 7005	Teaching & Research Practicum II	1
Teaching Assistantship		
Seminar Attendance		

BIOSCIENCE AND ENGINEERING TRAINING

Integrative Core Series (BMED 7011/BMED 7012/BMED 7013)
Integrative core courses introduce students to an open-ended, problem-solving environment central to their success in a PhD program. The courses may be co-taught (i.e., "engineer" and "bioscientist") and focus on a particular topic area. Students will—in the context of that topic area—address fundamental technical issues, critically read and evaluate literature, pose well- developed research questions that can be addressed by either experimental or modeling approaches (or both), and understand the importance and limitations of these approaches. In the course, one hour will be dedicated to ethical issues in the topic area related to science and engineering in society. As a group, the three integrative core courses offered span research areas of our program and the organizational hierarchy from molecular to organismic. Each student will select the integrative core course that fits her/his interests, and he/she should complete the course in the first year in the program prior to taking the qualifying exam.

Bioscience/Engineering/Data Science Fundamentals (Course numbers vary)
Engineering/bioscience fundamental courses focus on fundamental knowledge in engineering, in bioscience, and at the intersection of the two. These courses may be offered by the Wallace H. Coulter Department of Biomedical Engineering or by other units at Georgia Tech and Emory. **Students must complete 21 semester hours in this category, with a minimum of one bioscience, one data science, and one engineering course.** The overall balance of bioscience, data science, and engineering courses is determined by the student and his/her advisor and should factor the student's prior knowledge and research. Courses must be documented on the Program of Study form and must be approved by the Graduate Program Committee.

Advanced Graduate Seminar (Course numbers vary)
The Advanced Graduate Seminar course is designed to teach students how to develop breadth and depth of knowledge in a specific topic area. All Advanced Seminars achieve the following objectives: 1) Understanding of fundamental principles, approaches, and tools; 2) Identification of leading edge questions; 3) Identification of gaps in knowledge; and 4) Identification of technical challenges faced.

ETHICS TRAINING

Online Training

All students are required to complete online RCR training within the first 90 days of enrollment. This training is offered through the Collaborative Institutional Training Initiative (CITI).

Jones Program of Ethics (JPE 600, 610)
Emory's Laney Graduate School requires that all BME students complete JPE 600 and 610. JPE 600 is a one-day session at Emory University prior to the start of each fall term. The course provides 6 hours of content covering a broad historical and philosophical overview of ethics, identifies key ethical issues students are likely to face throughout their careers, presents the role of ethics in research and professional practice, and through case studies helps students develop a process for evaluating ethical issues. Students must attend the entire course in their first year to receive credit. JPE 610 is a series of educational sessions.

Students must attend four sessions, and approved sessions may be offered at Georgia Tech or Emory. Confirmation of course completion of both courses is recorded on the student's Emory transcript and is required for graduation.

Program-Specific Courses (BMED 7004, Integrative Core, Advanced Graduate Seminar) BME graduate students must complete the ethics training module in BMED 7004 Teaching and Research Practicum I, which includes eight hours of in-person training. Topics include authorship and publication, collaborative research, conflict of interest, data management, peer review, policies regarding the use of human subjects and vertebrate animals in research, research misconduct, and the responsibilities of mentors and mentees.

All students in interdisciplinary programs may submit a transcript record of a Georgia Tech- approved RCR training course to the Director of Graduate Training to waive the requirement of completing the ethics training module of BMED 7004.

Integrative Core and Advanced Seminar courses include 1.5 hours each of in-person RCR training in appropriate topic areas for a total of three additional hours of RCR training. This is required only of BME students.

PROFESSIONAL DEVELOPMENT TRAINING

TATTO (Emory) or TA Orientation (Georgia Tech)
All BME students must complete TATT 600, a 2-day workshop just prior to the start of the Fall term. All BME students with only a Georgia Tech affiliation (i.e., interdisciplinary program students) must attend Georgia Tech's TA Orientation.

Program-Specific Courses (BMED 7001, BMED 7004, BMED 7005)
BME students are required to complete four terms of the BMED 7001 seminar course. When enrolled, students attend a minimum of five research seminars and two professional/career development seminars per term. Georgia Tech and Emory University host seminars that fulfill the attendance requirement. A Seminar Participation Form documenting the seminar titles, dates, and host institutions for seminars attended must be completed, signed, and submitted by the student, to the course management site in order for the students to receive a Satisfactory (S) grade in the BMED 7001 course. A student who fails to register for the course will not be able to apply attendance from one term to a future term's registration. A student who registers but fails to submit the completed and approved Participation Form will receive an Unsatisfactory (U) grade for the course.

All BME students must register for BMED 7004 and BMED 7005 during their first and second terms as TA, respectively. This series of classes provides students with instructional and application- oriented teaching training, as well as provide information relevant to academic life. In addition, BMED 7005 Teaching & Research Practicum II course contains topics relevant for academic life and career preparation (i.e., a professional development training module, which provides, training in the areas of mentorship, project management, career exploration, and communications).

Teaching Assistantship
Teaching is considered an integral part of the educational experience and is a requirement of the program. Doctoral students serve as a Teaching Assistant (TA) for two semesters, whereas master's students serve as a TA for one semester. The Director of Graduate Training finalizes TA assignments during the semester prior to the start of the TA position. Students enroll in training courses concurrently with their TA position, typically the Fall and Spring semesters of the second year in the program.

PKU PROGRAM

Students enrolled in the PKU program are subject to language and ethics training requirements that differ from those outlined for BME students. All policies are approved by a joint Atlanta-Beijing PKU Graduate Committee. Questions may be directed to the Director of the PKU program.

Global Perspectives Requirement
Students enrolled in the PKU program may enroll in one required optional global perspectives course on each campus (i.e., Georgia Tech/Emory and PKU). Courses must be approved by the BME Graduate Program Committee.

Language Requirement
PKU students who matriculate first on the Beijing campus must demonstrate English proficiency via the TOEFL requirement during the admission process. PKU students who matriculate first on the Atlanta campus must complete the Chinese language requirement by completing the Georgia Tech CHIN 1001 course by end of second year with a minimum grade of B. PKU students are encouraged to take further CHIN courses to improve Chinese proficiency. Students may exempt the course requirement by contacting the Georgia Tech Modern Languages department for an assessment early in the first term of enrollment. Results of the assessment will be sent via e-mail to the Graduate Program Manager. All course(s) (exempt or for-credit) must be noted on the Program of Study.

Ethics Series
Students that matriculate first on the Beijing campus must complete the JPE 600, JPE 610, the ethics training module of BMED 7004 and ethics training within the integrative core and advanced seminar courses upon enrollment at the Atlanta campus

Foreign Study Programs

An additional option for the joint biomedical engineering degree is offered between the WHC Department of Biomedical Engineering at Georgia Tech & Emory University and Peking University in Beijing, China. The curriculum is the same with the addition of global perspectives courses. Students spend the majority of their time in the program on the "home" campus (either Atlanta or Beijing) with one year abroad for research with a faculty co-advisor. This partnership provides the opportunity to create a new paradigm for global biomedical engineering education and research. The program offers a unique means for U.S. and Chinese students who want to learn and work in a global economy and in global health settings. Program graduates will be prepared to become global

leaders of innovation who can contribute to cultural, political, economic and health concerns in their home countries and around the world.

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DOCTOR OF PHILOSOPHY WITH A MAJOR IN BUILDING CONSTRUCTION

The Doctor of Philosophy degree program in the School of Building Construction (BC) was approved by the Board of Regents in October 2011; the degree awarded is the Doctor of Philosophy with a major in Building Construction.

For more information, contact:

Academic Advisor
School of Building Construction
Georgia Institute of Technology
Atlanta, Georgia 30332-0680
404.385.7089
bc.gatech.edu

The program of study requires a minimum of two years of full-time residency (not fewer than four semesters excluding summer) devoted to coursework and other preparation for advancement to candidacy. A total of 60 credit hours will be required for this PhD degree beyond the master's degree.

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

Programs of study must include:

Code	Title	Credit Hours
Program Core		
BC 7100	Quantitative Methods for Construction Research	3
BC 7200	Advanced Readings in BC in Preparation for the PhD Comprehensive Examination	6
BC 8000	PhD Seminar for Students with Building Construction Emphasis	1
BC 8100	Research Methodology	3
Concentration Electives		
Select a minimum of twelve credit hours.		12
Minor		
Select a minimum of 9 credit hours.		9
Thesis		
BC 8999	Doctoral Thesis Preparation	12
BC 9000	Doctoral Thesis	14
Total Credit Hours		**60**

[1] A minimum of twelve credit hours of concentration electives, chosen from a list of approved electives (revised every semester by the faculty in the School of Building Construction). This list is composed of graduate courses offered by other graduate programs at Georgia Tech.

The major and minor requirements are minimums; the particular field of study may require additional work.

Additional requirements will be established by the PhD advisor, in consultation with the BC Graduate Faculty on a case-by-case basis, in order to ensure each student is taking courses which can directly assist them toward gaining advanced proficiency in their chosen area of research.

A program of study must be approved by the student's PhD Advisor. Each student will have a plan of study to ensure that the student's educational goals may be achieved while meeting the academic policies of the Institute and the PhD program. The Building Construction PhD program will enable students of exceptional ability and with a strong interest in research to undertake advance study in the field of building construction and facility management; it will also build off existing collaborations between the School and other academic units in the Institute to encourage interdisciplinary scholarship.

A student must choose a minor field of study that is most relevant to their research, with the major field being in Building Construction. The minor field must be outside of the School of Building Construction, must include at least nine hours of coursework, taken on a letter grade basis of "B" or better, and must be approved by the PhD Advisor, working in consultation with Graduate Faculty in the School of Building Construction, and the Office of Graduate Studies and Admissions. Although the student's plan of study will be approved, the student must additionally submit a letter and receive approval for the completion of the coursework on the chosen minor.

An overview of program requirements includes:

- A Program of Study must be approved by the student's PhD Advisor. Additional requirements may be set by the Graduate Faculty in the School of Building Construction.
- The student must have a minor field of study; the minor field must be outside of the School of Building Construction and must include at least nine hours of coursework. The minor must be approved by the PhD Advisor, working in consultation with BC Graduate Faculty, and the Office of Graduate Studies.
- Complete a Qualifying Paper, if applicable.
- Pass a PhD comprehensive (qualifying) examination consisting of written and oral portions.
- Complete a PhD proposal and orally defend the proposal. The student is considered a PhD candidate at that time.
- Complete a PhD dissertation and orally defend the dissertation.

To remain in good standing in the program, a student must be enrolled in a minimum of 6 credit hours of coursework (not including independent study) per semester during completion of the required four semesters in residence. Exceptions to this requirement will be allowed upon approval of the BC Graduate Faculty.

After or while taking the required six credit hours of Advanced Readings in Building Construction (BC 7200), that will prepare the student for the Comprehensive Examinations, the student must register for a minimum of twelve hours of Doctoral Thesis Preparation (BC 8999); generally these hours are taken in the third year of study in preparation for the Dissertation Proposal. Typically, an additional year or more is required to complete the dissertation. During semesters the student is working on the dissertation, he/she must register for a minimum of 3 credit hours of Doctoral Thesis Preparation (BC 9000. In total, a minimum of 14 credit hours of BC 9000 are required for graduation, and a minimum of 26 credit hours of thesis hours are required. Satisfaction of the requirements for the Ph. D. degree includes successful public defense of the dissertation.

Curriculum Overview

Code	Title	Credit Hours
Program Core		
BC 7100	Quantitative Methods for Construction Research	3
BC 7200	Advanced Readings in BC in Preparation for the PhD Comprehensive Examination	6
BC 8000	PhD Seminar for Students with Building Construction Emphasis	1
BC 8100	Research Methodology	3
Concentration Electives		
To include the study of: history and precedent in the field; theory and concepts and their evolution; current debate; and methods of analysis and inquiry.		12
Minor Field of Study		
To include the study of: relevant history and precedent in the field; relevant theory; current debate; and methods of analysis and inquiry.		9
Thesis Preparation		
BC 8999	Doctoral Thesis Preparation (minimum)	12
BC 9000	Doctoral Thesis (minimum)	14
Total Credit Hours		**60**

DOCTOR OF PHILOSOPHY WITH A MAJOR IN CHEMICAL ENGINEERING

The School of Chemical & Biomolecular Engineering offers the PhD degree in Chemical Engineering. Research opportunities exist in a broad range of areas of importance to chemical engineers and society, including catalysis, reaction kinetics, complex fluids, microelectronics, microfluidics, optimization, bioinformatics, polymers, sustainable development, pulp and paper, separations, CO_2 capture, biomedicine, solar energy, thermodynamics, MEMS, environmental science, reaction engineering, cancer diagnostics and therapeutics, biofuels, air quality, modeling, and process synthesis and control. Furthermore, the School of Chemical & Biomolecular Engineering participates with other schools in offering the PhD degree in Bioengineering. Additional information about the School is available https://www.chbe.gatech.edu/ or upon request by calling 404.894.1838.

PhD students in Chemical Engineering must successfully complete the following courses (or their equivalents) with an average cumulative GPA of 3.0 or higher. Additionally PhD students must earn a GPA of 3.2 or higher in the five 3-credit-hour core courses.

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

Code	Title	Credit Hours
CHBE 6001	Introdcution to Research and Resposible Conduct of Research for ChBE Graduate Students	1
CHBE 6003	Chemical Process Safety	1
CHBE 6100	Advanced Chemical Engineering Thermodynamics	3
CHBE 6200	Advanced Transport Phenomena, Fluid Mechanics, and Heat	3
CHBE 6260	Transport Phenomena-Mass Transfer	3
CHBE 6300	Kinetics and Reactor Design	3
CHBE 6500	Mathematical Modeling and Analysis of Chemical Processes	3
CHBE Elective		3
Minor Field of Study		9

Additional enriching requirements of the PhD program include earning 10 units in the Professional Preparation Program, participating in teaching for three semesters (5 hours per week), and presenting their research in the Fourth-Year Colloquium.

PhD students must take and pass the qualifying exam in their second semester. Students also have a second opportunity to take and pass the exam, the next time it is given. PhD students must defend their research proposal to their committee in the spring of their second year. Prior to their thesis defense, PhD students must hold a predoctoral review with their committee, at least six months before the thesis defense.

The thesis defense examination will be conducted by the Doctoral Examination Committee chosen by the student and the thesis advisor and approved by the Graduate Studies Committee and the Dean of Graduate Studies. The examination will be announced throughout the School and will be open to the academic community. The student will be required to make an oral presentation of the final thesis. If both the dissertation and examination are satisfactory, and there is compliance with all the requirements of the PhD program, then the candidate will be certified as qualified to receive the degree of Doctor of Philosophy.

DOCTOR OF PHILOSOPHY WITH A MAJOR IN CHEMISTRY

The Ph.D. in Chemistry provides students with in depth knowledge of a focused area of Chemistry or Biochemistry, and requires that students complete an independent, scholarly research project with results worthy of publication in the peer reviewed scientific literature. This degree prepares students for a variety of different career paths, including research and development in industry or government, intellectual property law, technical consulting and also faulty positions at universities and colleges. Course work is usually completed within the first two years of study. Students typically complete the requirements for candidacy, which consist of a series of examinations in the major area based on a reading assignments from the recent literature and an original research proposal, by the end of their second year. Later years are devoted to the completion of a research project and the publication of the results from the project. Candidates must write and defend a thesis describing their research as the final degree requirement.

Chemistry Website

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

Code	Title	Credit Hours
Coursework from areas of Specialization [1,2,3]		**6**
Seminars		
CHEM 8000	Seminar in Chemistry	1
CHEM 7001	Introduction to Research	3
CHEM 8001	Faculty Seminar	1
CHEM 8002	Information Resources for Chemists and Biochemists	2
CHEM 8003	Student Seminar [2]	2
CHEM 8801	Special Topics (Writing Effective Research Proposals and Manuscripts)	1
Doctoral Thesis [4]		**5**
Doctoral Minor [2,3]		**9**
Qualifying Examinations [5]		
Candidacy Requirements [6]		
Total Credit Hours		**30**

1. In addition, to the 9 hours of courses required for the minor, a further 6 hours of course work must be completed. These 15 hours of course work must encompass at least two areas of specialization and at least two courses must be core courses from traditional specializations (inorganic chemistry, analytical chemistry, organic chemistry, physical chemistry, biochemistry, and polymer chemistry).
2. Must be completed with a grade of B or higher
3. All courses must be letter-grade and students must have a 3.0 GPA overall and 3.0 GPA for the courses used towards the minor
4. Students will typically have far more credit for doctoral thesis than this.
5. Students must successfully complete a set of literature examinations. This is usually done in their 1st year.
6. To gain candidacy, students must prepare and defend in front of their doctoral advisory committee an initial thesis proposal and a summary of research progress. This is usually done before the end of their 2nd year.

GPA Requirement

- Students must have a GPA greater than 2.5 based on two or more classes that count towards the degree after their first semester in order to continue and take literature exams. Students with a GPA less than this must petition the School's graduate program committee to continue in the program
- Students must have GPA greater than 2.7 based on four or more classes that count towards the degree after their second semester to continue in the program. Students with GPA less than will need to acquire approval to continue in the program

Other Requirements

- Annual written progress reports describing the original research
- Annual meetings with their doctoral advisory committee to review progress
- A review, six months prior to thesis defense, of the proposed contents for the thesis
- Defense of a thesis describing original research

Core and elective courses for commonly pursued traditional areas of specialization are listed below. However, alternative course combinations, corresponding to other areas of specialization, are strongly encouraged. Course combination for other areas of specialization should be developed and approved in consultation with the faculty research advisor and the director of graduate studies. Examples of other areas of specialization include Biophysical Chemistry, Chemical Biology, Computational and Theoretical Chemistry, Energy and Catalysis, Metallobiochemistry, Materials Chemistry and Nanoscience.

Code	Title	Credit Hours
Inorganic Chemistry Specialization		
Core		
CHEM 6170	Inorganic Chemistry I	3
CHEM 6172	Physical Methods in Inorganic Chemistry	3
Elective		
CHEM 6171	Inorganic Chemistry II	3
CHEM 6181	Chemical Crystallography	3
CHEM 6182	Chemistry of the Solid State	3
CHEM 6183	Organometallic Chemistry	3
CHEM 8813	Special Topics in Inorganic Chemistry	3
Analytical Chemistry Specialization		
Core		
CHEM 6271	Analytical Chemistry I	3
CHEM 6281	Mass Spectrometry	3
Elective		
CHEM 6272	Analytical Chemistry II	3
CHEM 6273	Analytical techniques for chemistry and biology	3
CHEM 6282	Chemical Sensors	3
CHEM 6283	Electroanalytical Chemistry	3
CHEM 6284	Environmental Analytical Chemistry	3
CHEM 6285	Analytical Spectroscopy	3

CHEM 6287	Scanned Probe Techniques	3
CHEM 6288	Analytical Separations	3
CHEM 8823	Special Topics in Analytical Chemistry	3
Organic Chemistry Specialization		
Core		
CHEM 6370	Organic Reaction Mechanisms	3
CHEM 6371	Identification of Organic Compounds	3
CHEM 6372	Physical Organic Chemistry	3
Elective		
CHEM 6373	Organic Synthesis	3
CHEM 6381	Advanced Organic Synthesis	3
CHEM 6382	Computational Methods in Organic Chemistry and Biochemistry	3
CHEM 8833	Special Topics in Organic Chemistry	3
Physical Chemistry Specialization		
Core		
CHEM 6481	Statistical Mechanics	3
or CHEM 6755	Theoretical Chemistry of Polymers	
CHEM 6491	Quantum Mechanics	3
or CHEM 64	Quantum Chemistry and Molecular Spectroscopy	
Elective		
CHEM 6471	Chemical Thermodynamics and Kinetics	3
CHEM 6482	Chemical Kinetics and Reaction Dynamics	3
CHEM 6483	Chemistry of Electronic Organic Materials	3
CHEM 6484	Chemistry of Optical Organic Materials	3
CHEM 6485	Computational Chemistry	3
CHEM 6492	Molecular Spectroscopy	3
CHEM 8843	Special Topics in Physical Chemistry	3
Biochemistry Specialization		
Core		
CHEM 6571	Enzymology and Metabolism	3
CHEM 6572	Macromolecular Structure	3
CHEM 6573	Molecular Biochemistry	3
Elective		
CHEM 6501	Biochemistry I	3
CHEM 6502	Biochemistry II	3
CHEM 6581	Protein Crystallography	3
CHEM 6582	Biophysical Chemistry	3
CHEM 6583	Drug Design and Discovery	3
CHEM 6584	Contemporary Biochemistry	3
CHEM 6756	Discovery of Signaling Molecules	3
CHEM 6760	Biocatalysis and Metabolic Engineering	3
CHEM 8853	Special Topics in Biochemistry	3
Polymer Chemistry Specialization		
Core		
CHEM 6750	Preparation and Reaction of Polymers	3
CHEM 6752	Polymer Characterization	4
Elective		
CHEM 6751	Physical Chemistry of Polymer Solutions	3
CHEM 6757	Advanced Polymer Chemistry	3
CHEM 8873	Special Topics in Polymer Chemistry	3

DOCTOR OF PHILOSOPHY WITH A MAJOR IN CITY AND REGIONAL PLANNING

Georgia Tech has been awarding doctoral degrees in the field of City and Regional Planning since 1985, producing distinguished academics and scholars who work in universities and other research settings.

PhD students pursue advanced studies and research on issues most critical to the field of City and Regional Planning. The PhD program engages extensively with other programs, research centers, and colleges as it delivers its major and minor fields of study. Program graduates are expected to be well qualified to serve in a range of settings such as universities, planning consultancies, research and development firms, government agencies, and advanced practice.

Successful applicants have exceptional potential as scholars and fit with the School's research capabilities. Most applicants have completed an accredited master's degree in City and Regional Planning or a related field and have backgrounds in their proposed area of specialization. The program does admit capable applicants lacking this preparation, but these applicants may be required to undertake remedial work. Students are generally admitted for first enrollment for the fall semester only.

The program requires Graduate Record Examination (GRE) test scores taken within the last five years. Scores are expected to be well above the average. Non-native speakers of English are expected to have a minimum IB TOEFL score of at least 620/261/102 (paper, computer, and internet tests, respectively). Prior study in the United States does not waive this requirement.

For more information about the PhD program, contact:

Academic Advisor
Graduate Student Admissions, Advising, and Graduation Clearance
School of City and Regional Planning
College of Design
Georgia Institute of Technology
Atlanta, Georgia 30332-0155
Email: crp@design.gatech.edu

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

Code	Title	Credit Hours
Core Courses		
CP 8200	Advanced Planning Theory	3
CP 8300	Advanced Urban and Regional Development Theory	3
CP 8400	Research Design and Qualitative Methods	3
CP 8500	Spec Prob-City Planning	1-21
CP 8012	PhD Foundations Seminar	1
CP 8022	PhD Seminar in Research and Pedagogy	1
Major Field of Study		**15**
Minor Field of Study		**9**
Comprehensive Exams [1]		
Dissertation [2]		

1. The Core exams consist of three 8-hour exams, designed to test for core competency in planning. The exams cover the three core areas of planning theory, urban and regional theory, and research methods and design. Each section of the exam will be based on a bibliography or specified set of concepts, as provided to the student in the corresponding core course. Major and Minor Exam will consist of both written and oral components. The written test will consist of a 2-day major exam (48 hours) and a 1-day minor exam (24 hours).
2. Students are required to complete a dissertation reporting the results of independent research that advances theory or applied knowledge in City and Regional Planning. The dissertation must be successfully defended to the student's dissertation examination committee.

DOCTOR OF PHILOSOPHY WITH A MAJOR IN CIVIL ENGINEERING

The Ph.D. program in the School of Civil and Environmental Engineering is offered to students with an excellent academic background and a capacity for independent research.

Major Areas of Specialization are:

- Construction and Infrastructure Systems Engineering
- Environmental Engineering
- Geosystems Engineering
- Structural Engineering, Mechanics and Materials
- Transportation Systems Engineering
- Water Resources Engineering

The Ph.D. program in the School of Civil and Environmental Engineering is offered to students with an excellent academic background and a capacity for independent research. Doctoral candidates tailor a highly individualized Program of Study (typically 50 credit hours of courses beyond the bachelor's degree) to develop expertise in their major specialization area. As part of the Program of Study, candidates must complete a Minor Field of Study. To demonstrate the ability for independent research, the candidate must pass a qualifying examination, a thesis proposal, and a thesis defense. Candidates are required to complete a doctoral thesis reporting the results of original and independent research that derives from the scientific method and demonstrates creativity and technical expertise in the principles and methods essential to modern Civil & Environmental Engineering.

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

DOCTOR OF PHILOSOPHY WITH A MAJOR IN COMPUTATIONAL SCIENCE AND ENGINEERING

The Computational Science and Engineering (CSE) program is an interdisciplinary program addressing the body of knowledge, skills, and practices associated with the study of computer-based models of natural phenomena and engineered systems. Students will be required to obtain a breadth of knowledge across a set of core areas, depth of knowledge in a specific computational specialization (e.g., numerical computing), and knowledge to apply computational techniques in a domain of application. Students will be expected to integrate principles from mathematics, computing, science, and engineering to be able to create significant computational artifacts (e.g., software), and to complete independent research that advances the state-of-the-art in the CSE discipline.

The CSE Ph.D. degree program is an interdisciplinary program offered by the College of Computing, the College of Engineering, and the College of Sciences. Once admitted, students follow the CSE program's degree requirements and curriculum.

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

Code	Title	Credit Hours
Required Course		
CSE 6001	Introduction to Computational Science and Engineering	1
Core Courses		
Select four of the following:		12
CSE/MATH 6643	Numerical Linear Algebra	
CSE 6140	Computational Science and Engineering Algorithms	
CSE 6730	Modeling and Simulation: Foundations and Implementation	
CSE/ISYE 6740	Computational Data Analysis: Learning, Mining, and Computation	
CSE 6220	High Performance Computing	
Computation Specialization		
Select at least nine credit hours of specialization courses. [1,2]		9
Application Specialization		
Select at least nine credit hours of specialization courses. [2,3]		9
Qualifying Exam [4]		
Doctoral Thesis [5]		
Total Credit Hours		**31**

1. The computational specialization includes at least nine hours of courses that increase the student's depth of understanding of computational methods in a specific area, as approved by the student's academic advisor. These courses must go beyond "using computers" to deepen understanding of computational methods, preferably in the context of some application domain.
2. At least nine hours of PhD courses must be courses that do not carry the CS/CSE course designation. These hours may be taken in CEE. Hours taken as part of the computation and/or application specialization can be used to fulfill this requirement.
3. The application specialization includes at least nine hours of courses that increase depth of understanding in an application field; these need not be computation-focused courses.
4. A qualifying examination must be attempted by the end of the second year of enrollment in the CSE doctoral program (normally taken after the student completes CSE core coursework). A qualifying examination committee shall be appointed by the CSE program coordinator for each student and is responsible for making an overall recommendation concerning the outcome of the qualifying examination.
5. Students are required to complete a doctoral thesis reporting the results of independent research that advances the state-of-the-art in the computational science and engineering discipline. The thesis must be successfully defended to the student's thesis committee.

DOCTOR OF PHILOSOPHY WITH A MAJOR IN COMPUTER SCIENCE

For more information about the Computer Science PhD program, visit www.cc.gatech.edu.

The Computer Science Doctoral Program begins with research and breadth components. The research component helps students place an early focus on research. Students must complete an "Introduction to Graduate Studies" course (CS 7001) and then take at least three credit hours of directed research study (CS 8903) under faculty guidance each semester until their qualifying examination. The breadth component is intended to facilitate students' learning about a variety of areas within computing, as well as core computer science areas. Students must take at least twelve courses from the different areas of study within the College. The current twelve areas are computer architecture, database systems, graphics and visualization, human-computer interaction, information security, intelligent systems and robotics, learning sciences and technology, networking and communications, programming languages and compilers, software methodology and engineering, systems (including operating systems, distributed and parallel systems), and theoretical computer science. Students must include courses from the systems and theory areas in those breadth courses.

As students' research progresses, they must select a primary, and possibly secondary, area of focus from the areas listed previously, and then pass a qualifier (comprehensive exam) in that area or areas. The qualifier consists of three parts:

1. A one-day written examination covering the pertinent research area(s)
2. The submission of a high-quality research deliverable, as evidenced by a portfolio consisting of at least an exam committee-reviewed and publishable article, and possibly other work products as approved by the exam committee
3. An oral presentation and examination

After successfully completing the qualifier, a student focuses on research leading toward a dissertation. The topic of the student's research is formalized through a written dissertation proposal followed by an oral presentation. When the student passes their proposal, the student is admitted to candidacy and proceeds with dissertation research. This phase is completed with the successful defense and submission of the approved doctoral dissertation. Students are also required to complete a nine-hour minor outside the College.

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

DOCTOR OF PHILOSOPHY WITH A MAJOR IN DIGITAL MEDIA

The Digital Media PhD was inaugurated in fall 2004 and is one of the first of its kind worldwide. The program educates research-oriented theorists/practitioners who bring the traditions of the humanities and arts to the design of digital media. The program provides the theoretical and practical foundations for research and leadership careers in academia and industry, critically engaging with the design, use, and role of digital media in culture.

Graduates of the program are prepared to work in industry, public service, and universities, shaping the emerging digital genres and expanding our understanding and mastery of the representational power of the computer.

The PhD program accepts 3-5 new candidates each year.

For more information visit: http://dm.lmc.gatech.edu/program/phd-program/

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

The core curriculum is designed to cover three fundamental areas:

1. critical history, theory, and practice of using of computing technologies for expressive purposes
2. advanced principles of interaction design
3. applied research methods in digital media

Code	Title	Credit Hours
Foundational and Required Courses		
LMC 6310	The Computer as an "Expressive Medium"	3
LMC 6313	Principles of Interaction Design	3
LMC 6316	Historical Approaches to Digital Media	3
LMC 6399	Discovery & Invention	3
LMC 6650	Project Studio (repeat 2 times) [1]	6
LMC 6800	Digital Media Master's Project	6
or LMC 7000	Digital Media Master's Thesis	
LMC 8000	Proseminar in Media Theory [1]	3
LMC 8001	Proseminar in Digital Media Studies [1]	3
LMC 9000	Doctoral dissertation in Digital Media [1]	6
Minor Concentration		
Minor Concentration [2,3]		9
Electives		
Select five of the following: [4]		15
LMC 6311	Visual Culture and Design	
LMC 6312	Design, Technology & Representation	
LMC 6314	Design of Networked Media	
LMC 6315	Product Production	
LMC 6317	Interactive Narrative/Fiction	
LMC 6318	Experimental Media	
LMC 6319	Intellectural Property Policy and Law	
LMC 6213	Edu Applications New	
LMC 6215	Issues in Media Studies	
LMC 6320	Globalization and New Media	
LMC 6321	Architecture of Responsive Spaces	
LMC 6650	Project Studio	
LMC 7999	PhD Qualifying Prep (variable credit)	
LMC 8803	Special Topics in Digital Media (repeatable)	
LMC 8813	Advanced Issues in Interactive Narrative (repeatable)	
LMC 8823	Special Topics in Game Design and Analysis	
LMC 8903	Special Problems in Human-Computer Interaction	
LMC 8831	Special Topics in Technologies of Representation (repeatable)	
LMC 8999	PhD Doctoral Prep	
Total Credit Hours		**60**

1. These courses are not open to waiver or substitution. Other courses may be substituted with equivalent previous work or alternate courses. Students should consult their advisors and the Director of Graduate Studies to determine the appropriate individual course of study.
2. Three related courses outside of the School of Literature, Communication, and Culture. These courses may be in other Schools of the Ivan Allen College, or in colleges or interdisciplinary fields of the Institute. Examples of a minor concentration in Computer Science: CS 6750, CS 6460, CS 6470.
3. This requirement must be certified by filing a form signed by the DGS with the Georgia Tech graduate office. The form is available online at http://www.gradadmiss.gatech.edu/theses-dissertations.
4. Elective courses from other academic units may be substituted with approval of the DGS.

DOCTOR OF PHILOSOPHY WITH A MAJOR IN EARTH AND ATMOSPHERIC SCIENCES

In the doctoral program at the School of Earth and Atmospheric Sciences, students are engaged primarily in original, independent research that culminates in the doctoral dissertation. In this School, students can specialize in atmospheric chemistry, aerosols, and clouds; dynamics of weather and climate; geochemistry; geophysics; oceanography; paleoclimate; planetary science; and remote sensing . With approval of the School's faculty, multidisciplinary programs of study are also permitted. In each area of specialization, doctoral students are required to complete a faculty-approved set of core courses and a comprehensive examination. Students are also required to complete nine credit hours of coursework in an academic minor.

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

Code	Title	Credit Hours
Core Courses [1]		**15**
EAS 6000-level or above		
Minor [2,3,,4]		**9**
EAS Academic Breadth [5]		
EAS Professional Preparation		
EAS 6000	Intro Research & Ethics	1
Comprehensive Exam [6]		

Minimum Deliverables

- One oral and one poster presentation or two oral presentations of the student's graduate work.
- One first author publication with at least one round of reviews received and not rejected
- A second first author publication submitted
- PhD Dissertation and defense

1 Seminar classes, special problems courses, and thesis hours cannot be counted towards this total. Special topics courses may be credited to this total with approval of the Graduate Coordinator

2 Minor courses can consist of courses from more than one School, including EAS, as long as the courses are not related to the student research area

3 Incoming Ph.D. students with prior graduate training may apply previously earned graduate credit hours toward the minor requirement.

4 The student plan for satisfying the minor requirement must be approved by the EAS Graduate Coordinator prior to completion of the comprehensive examination

5 The student selects one of the three possibilities offered with approval from the EAS Graduate Coordinator

6 The student takes the comprehensive exam either during the Spring of the second year or the Fall of the third year. Students not respecting this schedule are automatically transferred to the EAS M.S. program

DOCTOR OF PHILOSOPHY WITH A MAJOR IN ECONOMICS

Our curriculum features 24 credit hours of first year core courses, at least 30 credit hours of fields, and electives, and at least 24 credit hours of dissertation research (see Requirements tab). Thus, the minimum number of credit hours to be fulfilled is 72. Students receive rigorous training in microeconomic theory and quantitative methods during their first year of study.

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

Planned Curriculum and Sample Schedule

First Year		
Fall		**Credit Hours**
ECON 7004	Mathematics for Economists	3
ECON 7012	Microeconomic Theory I	3
ECON 7022	Econometrics I	3
Required Elective [1]		3
	Credit Hours	**12**
Spring		
ECON 7013	Microeconomic Theory II [2]	3
ECON 7023	Econometrics II	3
ECON 7025	Empirical Research Methods	3
Required Elective [1]		3
	Credit Hours	**12**
Second Year		
Fall		
Major Economics Field, Course I		3
Minor Economics Field, Course I		3
Elective		6
	Credit Hours	**12**
Spring		
Major Economics Field, Course II		3
Minor Economics Field, Course II		3
Elective		6
	Credit Hours	**12**
Third Year		
Fall		
Dissertation Research		6
	Credit Hours	**6**
Spring		
Dissertation Research		6
	Credit Hours	**6**
Fourth Year		
Fall		
Dissertation Research		6
	Credit Hours	**6**
Spring		
Dissertation Research		6
	Credit Hours	**6**
	Total Credit Hours	**72**

[1] Require Elective Options: ECON 7015, ECON 7031, ECON 7032, ECON 8997, CETL 8713, CETL 8717, or course approved by Director of Graduate Studies.

We offer three specialization fields

- Environmental Economics,
- Industrial Organization and
- International Economics.

Our fields build on our set of core courses, providing students with opportunities to explore research topics within three distinct but related areas. Each field provides an equal mix of theory and practice, consisting of two 3 credit hour courses.

Students are required to have a major and at least one minor in fields offered by the School of Economics. Occasionally, the School of Economics will offer elective courses that complement our field courses. In addition, students are allowed to take elective courses outside of Economics subject to the approval of the Director of Graduate Studies. A set of elective courses taken in another discipline will constitute a minor in that particular discipline if at least two courses are taken from this discipline.

Students must also register each semester for Dissertation Research, starting in the fall semester of the third year. In such a semester, students must register for at least six credit hours of Dissertation Research. Students must complete a minimum of 24 Dissertation Research credit hours to graduate.

Preliminary Examinations:

Students must take two preliminary examinations during the summer after the first year in the program in microeconomics (covering ECON 7012 and ECON 7013) and econometrics (ECON 7022 and ECON 7023) and earn a pass in both. Students will have two attempts for both exams. Should a student not pass one or both exams after two attempts, they will no longer remain in the PhD program, but will be able to earn a master's degree by completing six more credit hours.

Third year paper:

Each student must complete an original research paper by the end of the summer after the third year in the program. The paper has to answer an original research question. Should a student fail to complete the paper on time, they will be asked to leave the program.

DOCTOR OF PHILOSOPHY WITH A MAJOR IN ELECTRICAL AND COMPUTER ENGINEERING

Programs leading to the master's and doctoral degrees in Electrical and Computer Engineering are provided by the School. Technical interest areas include bioengineering, computer systems and software, digital signal processing, electrical energy, electromagnetics, electronic design and applications, microsystems, optics and photonics, systems and controls, telecommunications, and VLSI systems and digital design.

The doctoral degree program is research-oriented and highly individualized. Typically, at least four years of study beyond the bachelor's degree are required to complete the doctoral program.

PhD Information

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

Summary of Requirements

- Core curriculum (18 hours). These courses must be taken in technical interest areas as detailed in the course requirement section.
- Electives (14 hours)
- Minor (9 hours)
- Professional Communications Seminar (1 hour)
- Responsible Conduct of Research training (1 hour). The training consists of two parts: an online training (to be completed in the first 90 days of the program) and a class (PHIL 6000).
- Comprehensive Examination. In ECE, this is the combination of the Ph.D. Coursework Qualifier and the dissertation proposal.
- PhD dissertation

Course requirements

The Ph.D. course requirements include the course hours normally accumulated during the student's master's degree. The course requirements are as follows:

Code	Title	Credit Hours
Group I		
ECE 6000-level or higher classes in one or two TIAs [1]		9
Group II		
ECE 6000-level or higher classes [2]		9
Group III		
Minor in area outside ECE [3]		9
Group IV		
Electives [4]		14
ECE 8022 [5]		1
PHIL 6000	Responsible Conduct of Research (RCR) [6]	1
Total Credit Hours		**43**

1. Three classes in a combination of one or two technical interest areas of the student's choosing (All for letter grade credit). Technical Interest Areas (TIAs) are groups of related courses within electrical and computer engineering and include: Bioengineering, Computer Systems & Software, VLSI Systems & Digital Design, Digital Signal Processing, Electrical Energy, Electromagnetics, Electronic Design & Applications, Nanotechnology, Optics & Photonics, Systems & Controls, and Telecommunications.
2. Nine hours of classes, all of which must be outside of and not cross-listed with the TIA(s) of Group I (All for letter grade credit).
3. Nine hours of classes in a single discipline outside of ECE (All for letter grade credit). The minor is most often in mathematics or in computer science; the School of ECE maintains a list of Math courses and a list of Computer Science courses acceptable for a Ph.D. minor. Minor courses in another area will be considered; however, minor courses in non-technical areas (for example, management) will not be approved.
4. Up to 12 M.S. thesis hours, recorded as such on an official transcript, may be used in this area.
5. **Pass/fail.** Permit required. Pass the Coursework Qualifier to receive a permit.
6. **Pass/fail.** Students entering the Ph.D. program in Fall 2011 or later and M.S. students who were admitted for Fall 2011 or later and then transition to Ph.D. must take an RCR course to fulfill this requirement.

PhD residency requirement

Student must have at least two semesters of full-time, on-campus enrollment.

In addition, there are a number of requirements imposed by the Institute. These include:

- A minimum of 9 hours for letter grade must be taken at Georgia Tech.
- Student must maintain a 3.0 GPA, and a minimum 3.0 GPA for the minor (Group III) courses.
- Once admitted to candidacy, the student must complete all degree requirements within 7 years.

Comprehensive Examination

The ECE comprehensive examination is the combination of a coursework qualifier and a proposal exam.

Coursework qualifier. The Coursework Qualifier requirement is to obtain a 3.5 GPA in four courses that the student selects from lists prepared by the ECE Technical Interest Groups (TIGs). Further details are available in the ECE Graduate Student Handbook. The Coursework Qualifier requirement must be completed by the end of the second year.

Proposal exam. ECE Ph.D. students must complete their Proposal Exam by the end of their 7th term, not including summers. The student is expected to demonstrate background knowledge of their dissertation topic, as well as broader understanding of the discipline. The Proposal must contain a detailed plan for the completion of Ph.D.-level research on the dissertation topic, and preferably some results. However, it is understood that any results will be early and possibly inconclusive; and the dissertation topic, methods, and results may evolve considerably in-between the Proposal and the Ph.D. defense. Students are advised to seek the input of the committee on the research direction, and inform their committee members of significant changes.

Doctoral Dissertation

The primary requirement of the Ph.D. student is to do original and substantial research that is reported in the Ph.D. Dissertation and at the Final Defense. The School entrusts the standards of the School in this area to the Reading committee.

Joint Doctor of Philosophy with a Major in Electrical and Computer Engineering with the Politechnico Di Milano

The School of Electrical and Computer Engineering (ECE) offers a joint doctorate degree program between the Georgia Institute of Technology (Georgia Tech) and the Politecnico di Milano (PdM).

Politecnico di Milano is a highly ranked technical university located in one of the most industrialized regions of Italy Lombardy. It has close ties with industry at the national, European, and international levels; it shares similar strategic goals as those of Georgia Tech; it has complimentary resources that fully support students and faculty; and it participates in a number of important academic and economic projects within Europe and abroad.

This joint Ph.D. program will afford graduate students from each university the opportunity to: study and conduct research at an international peer engineering, science and computer research institution; gain confidence in working as a member of an international team; and live and study in an environment outside of their home country.

PhD Information

Joint Doctor of Philosophy with a Major in Electrical and Computer Engineering with the Politechnico di Torino (Italy)

The School of Electrical and Computer Engineering (ECE) offers a joint doctorate degree program between the Georgia Institute of Technology (Georgia Tech) and the Politecnico di Torino (PdT).

Politecnico di Torino is a highly ranked technical university located in one of the most industrialized regions of Italy - Piedmont. It has close ties with industry at the national, European, and international levels; it shares similar strategic goals as those of Georgia Tech; it has complimentary resources that fully support students and faculty; and it participates in a number of important academic and economic projects within Europe and abroad.

This joint Ph.D. program will afford graduate students from each university the opportunity to: study and conduct research at an international peer engineering, science and computer research institution; gain confidence in working as a member of an international team; and live and study in an environment outside of their home country.

PhD Information

DOCTOR OF PHILOSOPHY WITH A MAJOR IN ENGINEERING SCIENCE AND MECHANICS

The Ph.D. program in the School of Civil and Environmental Engineering is offered to students with an excellent academic background and a capacity for independent research.

Doctoral candidates tailor a highly individualized Program of Study (typically 50 credit hours of courses beyond the bachelor's degree) to develop expertise in their major specialization area. As part of the Program of Study, candidates must complete a Minor Field of Study. To demonstrate the ability for independent research, the candidate must pass a qualifying examination, a thesis proposal, and a thesis defense. Candidates are required to complete a doctoral thesis reporting the results of original and independent research that derives from the scientific method and demonstrates creativity and technical expertise in the principles and methods essential to modern Civil & Environmental Engineering.

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

DOCTOR OF PHILOSOPHY WITH A MAJOR IN ENVIRONMENTAL ENGINEERING

The Ph.D. program in the School of Civil and Environmental Engineering is offered to students with an excellent academic background and a capacity for independent research.

Doctoral candidates tailor a highly individualized Program of Study (typically 50 credit hours of courses beyond the bachelor's degree) to develop expertise in their major specialization area. As part of the Program of Study, candidates must complete a Minor Field of Study. To demonstrate the ability for independent research, the candidate must pass a qualifying examination, a thesis proposal, and a thesis defense. Candidates are required to complete a doctoral thesis reporting the results of original and independent research that derives from the scientific method and demonstrates creativity and technical expertise in the principles and methods essential to modern Civil & Environmental Engineering.

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

DOCTOR OF PHILOSOPHY WITH A MAJOR IN HISTORY AND SOCIOLOGY OF TECHNOLOGY AND SCIENCE

The School offers a program of graduate study in the history and sociology of technology and science at both the master's and doctoral levels. The two-year master's program consists of foundation courses in history, social theory, and research methods, as well as more specialized reading and research seminars. The program emphasizes the understanding of technology and science within a broad social and historical context. Students develop a strong general background in history and sociology, and acquire skills in research, social analysis, and writing.

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

Code	Title	Credit Hours
Required Courses		15
Electives		9
Research Paper (Special Problems) [1]		6
Comprehensive Exam (normally taken in the third academic year) [2]		
Dissertation		
Total Credit Hours		**30**

1. Completion of a satisfactory research paper is essential for those students wishing to proceed to doctoral candidacy.
2. The examinations cover material from three fields of study, which will be determined by a student's selection of history or sociology as the area of concentration.

In addition to satisfactory performance in the comprehensive examinations, students pursuing the degree in history must also pass a foreign language examination (normally in French, German, or Spanish) before being admitted to candidacy for the PhD. For students in sociology, an advanced sociological methods course replaces the language requirement. Having met these requirements, the candidate will submit a dissertation proposal, which must meet the approval of his or her dissertation committee. The candidate will then proceed to the final requirement for the degree: the completion of the PhD dissertation and its successful defense by oral examination.

DOCTOR OF PHILOSOPHY WITH A MAJOR IN HUMAN-CENTERED COMPUTING

Human-Centered Computing (HCC) is the interdisciplinary science of designing computational artifacts that better support human endeavors. HCC students examine issues - such as computer-supported collaborative work and learning, human-computer interaction, human-robot interaction, learning sciences and technology, and mobile and ubiquitous computing - that lie at the intersection of human concerns (such as anthropology, cognitive science, human factors, industrial design, media studies, psychology, and sociology) and computing studies (such as artificial intelligence, computational perception, databases, graphics, information security, networks, programming languages, and robotics).

Students must complete a core of the three courses described below. The required courses will help students develop the first two of the four competencies that must be demonstrated; these competency areas are

- computing concepts and skills,
- evaluation of HCC systems,
- written research communication, and
- oral research communication.

In consultation with their advisors, students must also complete at least three elective courses, including at least one outside the area of HCC specialization. Areas of elective study may include, but are not restricted to,

- artificial intelligence,
- cognitive science,
- collaboration,
- human-computer interaction,
- information security,
- learning sciences and technology,
- software,
- software engineering, and
- visualization.

Students must also pass a written and oral qualifier (comprehensive examination) and submit and receive approval for a dissertation topic and committee. Students may then be admitted to candidacy.

For more information about the HCC program, visit www.cc.gatech.edu.

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

Code	Title	Credit Hours
Core Courses		
CS 6451	Introduction to Human-Centered Computing	3
CS 6452	Prototyping Interactive Systems	3
CS 7455	Issues in Human-Centered Computing	3
Seminars		
CS 8001	Seminar	1
CS 8802	Special Topics	2
Specializations		**9**
Minor [1]		**6**
Total Credit Hours		**27**

Concurrently, each student develops a research portfolio under the supervision of a faculty advisor. The submission of a conference- or journal-quality paper, and a conference-style presentation, satisfies the competencies of written and oral research communications.

[1] The Ph.D. minor consists of six semester hours of classes from outside HCC. Thus, a Ph.D. minor within the College of Computing (but outside HCC) is also possible. The six hours must form one coherent area of study. If a course has a CS section and a non-CS section, then students should register for the CS section and not count it towards a minor. A minor may also include courses from outside Georgia Tech, for example, courses at Emory University or Georgia State University.

Specializations

Code	Title	Credit Hours
Artificial Intelligence		
CS 6476	Introduction to Computer Vision GR	3
CS 6601	Artificial Intelligence	3
CS 7476	Advanced Computer Vision	3
CS 7610	Modeling and Design	3
CS 7620	Case-Based Reasoning	3
CS 7632	Game Artificial Intelligence	3
CS 7633	Human-Robot Interaction	3
CS 7637	Knowledge-Based AI	3
CS 7650	Natural Language	3
CS 8803	Special Topics (Computational Creativity)	3
CS 8803	Special Topics (Expressive AI)	3

Code	Title	Credit Hours
Cognitive Science		
CS 6795	Introduction to Cognitive Science	3
CS 7695	Philosophy of Cognition	3
CS 7697	Cognitive Models of Science and Technology	3
CS 7790	Cognitive Modeling	4

Code	Title	Credit Hours
Human-Computer Interaction		
CS 6454	Qualitative Methods for Design of Human Computer Interaction	3
CS 6456	Principles of User Interface Software	3
CS 6750	Human-Computer Interaction	3
CS 7450	Information Visualization	3
CS 7470	Mobile and Ubiquitous Computing	3
CS 8803	Special Topics (Computers, Communications & International Development)	3

Code	Title	Credit Hours
Learning Science & Technology		
CS 6460	Educational Technology: Conceptual Foundations	3

Code	Title	Credit Hours
Social Computing		
CS 6465	Computational Journalism	3
CS 6470	Design of Online Communities	3
CS 6471	Computational Social Science	3
CS 6474	Social Computing	3
CS 7460	Collaborative Computing	3

DOCTOR OF PHILOSOPHY WITH A MAJOR IN INDUSTRIAL ENGINEERING

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

Students in the Ph.D. with a major in Industrial Engineering program choose a single track from: General Industrial Engineering, Supply Chain Engineering, Statistics, Economic Decision Analysis, and System Informatics & Control.

Each track has specific course requirements. Students are expected to complete the course programs described below prior to candidacy, and many of the courses are recommended to be completed prior to the comprehensive examination. Students seeking to waive a program course requirement must receive permission from the Associate Chair for Graduate Studies. It is not our intent to have students repeat coursework that they may have already mastered during prior graduate degree programs, so please ask for appropriate waivers.

General Industrial Engineering

Code	Title	Credit Hours
Methodology Core (4 courses)		
Group 1 (at least 2 courses)		
ISYE 6661	Linear Optimization	3
ISYE 6662	Discrete Optimization	3
ISYE 6761	Stochastic Processes I	3
ISYE 6832	Simulation Theory and Methods	3
ISYE 6412	Theoretical Statistics	3
ISYE 6414	Statistical Modeling and Regression Analysis	3
ISYE 6416	Computational Statistics	3
ISYE 6740	Computational Data Analysis: Learning, Mining, and Computation	3
Group 2		
ECON 7012	Microeconomic Theory I	3
ECON 7013	Microeconomic Theory II	3
CSE 6140	Computational Science and Engineering Algorithms	3
CS 6550	Design and Analysis of Algorithms	3
ISYE 6402	Time Series Analysis	3
ISYE 6412	Theoretical Statistics	3
ISYE 6413	Design and Analysis of Experiments	3
ISYE 6420	Introduction to Theory and Practice of Bayesian Statistics	3
ISYE 6663	Nonlinear Optimization	3
ISYE 6664	Stochastic Optimization	3
ISYE 6679	Computational Methods in Optimization	3
ISYE 6761	Stochastic Processes I	3
ISYE 7401	Advanced Statistical Modeling	3
ISYE 7405	Multivariate Data Analysis	3
ISYE 7406	Data Mining and Statistical Learning	3
ISYE 7661	Theory of Linear Inequalities	3
ISYE 7682	Convexity	3
ISYE 7683	Advanced Nonlinear Programming	3
ISYE 7686	Advanced Combinatorial Optimization	3
ISYE 7687	Advanced Integer Programming	3
ISYE 8813	Special Topics in Operations Research (Constraint Programming)	3
ISYE 8813	Special Topics in Operations Research (Game Theory)	3
Domain Core (at least 3 courses)		
HS 6000	Introduction to Healthcare Delivery	3
ISYE 6201	Manufacturing Systems	3
ISYE 6202	Warehousing Systems	3
ISYE 6203	Transportation and Supply Chain Systems	3
ISYE 6225	Advanced Engineering Economy	3
ISYE 6227	Introduction to Financial Engineering	3
ISYE 6230	Economic Decision Analysis	3
ISYE 6320	Public Impact Applications of Operations Research and Management Science	3
ISYE 6421	Biostatistics	3
ISYE 6673	Financial Optimization Models	3
ISYE 6785	The Practice of Quantitative and Computational Finance	3
ISYE 7201	Production and Service Systems Engineering	3
ISYE 7203	Logistics Systems Engineering	3
ISYE 7205	Inventory Theory	3
ISYE 8813	Special Topics in Operations Research (On Life Cycle Assessment)	3
Technical Elective (3 courses) [1,2]		

1 Decided in consultation with advisor.

2 Up to two technical electives may double-count toward satisfying the minor requirement

Comprehensive Exam

The General Industrial Engineering comprehensive exam has two parts:

1. Written exam: Students have to select any two courses from Group 1 methodology core of General Industrial Engineering track. They are required to solve one question each from these 2 topics. Both questions are to be solved in one three hour exam.
2. Research paper: The research paper must be submitted by the day of the exam. The paper must be:

- Written 100% by the student. (The student may mention the name of faculty/student collaborator.)
- No more than 10 pages (excluding references), font size 11, margin at least 1 inch.
- The first page should contain the title, the research collaborators, and a short abstract.
- The introduction should be a broadly accessible to a non-expert and contain exposition of the main goals, ideas and techniques, including motivation and a clear literature survey (The entire paper can be a literature survey paper).

Supply Chain Engineering

Code	Title	Credit Hours
Methodology Core (4 courses)		
Group 1 (at least 2 courses)		
ISYE 6661	Linear Optimization	3
ISYE 6662	Discrete Optimization	3
ISYE 6761	Stochastic Processes I	3
ISYE 6832	Simulation Theory and Methods	3
Group 2		
ISYE 6230	Economic Decision Analysis	3
ISYE 6412	Theoretical Statistics	3
ISYE 6414	Statistical Modeling and Regression Analysis	3
ISYE 6663	Nonlinear Optimization	3
ISYE 6664	Stochastic Optimization	3
ISYE 6740	Computational Data Analysis: Learning, Mining, and Computation	3
ISYE 7682	Convexity	3
ISYE 7683	Advanced Nonlinear Programming	3
ISYE 7686	Advanced Combinatorial Optimization	3
ISYE 7687	Advanced Integer Programming	3
ISYE 8813	Special Topics in Operations Research (Constraint Programming)	3
Domain Core (3 courses)		
Group 1 (at least 2 courses)		
ISYE 6202	Warehousing Systems	3
ISYE 7201	Production and Service Systems Engineering	3
ISYE 7203	Logistics Systems Engineering	3
ISYE 7205	Inventory Theory	3
Group 2		
ISYE 6201	Manufacturing Systems	3
ISYE 6203	Transportation and Supply Chain Systems	3
ISYE 6320	Public Impact Applications of Operations Research and Management Science	3
Computational Core (1 course) [1]		
ISYE 6679	Computational Methods in Optimization	3
CSE 6140	Computational Science and Engineering Algorithms	3
CS 6550	Design and Analysis of Algorithms	3
Technical Elective (2 courses) [2,3]		

1. Computational core may be chosen from the list above or can be other graduate-level courses related to the major area of study.
2. Decided in consultation with advisor.
3. Up to two technical electives may double-count toward satisfying the minor requirement

Comprehensive Exam

The Supply Chain Engineering comprehensive exam has two parts:

1. Written exam: Students have to select any two courses from Group 1 methodology core of Supply Chain Engineering track. They are required to solve one question each from these 2 topics. Both questions are to be solved in one three hour exam.
2. Research paper: The research paper must be submitted by the day of the exam. The paper must be:
   - Written 100% by the student. (The student may mention the name of faculty/student collaborator.)
   - No more than 10 pages (excluding references), font size 11, margin at least 1 inch.
   - The first page should contain the title, the research collaborators, and a short abstract.
   - The introduction should be a broadly accessible to a non-expert and contain exposition of the main goals, ideas and techniques, including motivation and a clear literature survey (The entire paper can be a literature survey paper).

Statistics

Code	Title	Credit Hours
Domain Core (4 courses)		
ISYE 6412	Theoretical Statistics	3
ISYE 6413	Design and Analysis of Experiments	3
ISYE 6416	Computational Statistics	3
ISYE 7401	Advanced Statistical Modeling	3
Statistics Electives (4 courses)		
ISYE 6402	Time Series Analysis	3
ISYE 6404	Nonparametric Data Analysis	3
ISYE 6420	Introduction to Theory and Practice of Bayesian Statistics	3
ISYE 6421	Biostatistics	3
ISYE 6740	Computational Data Analysis: Learning, Mining, and Computation	3
ISYE 6781	Reliability Theory	3
ISYE 6783	Statistical Techniques of Financial Data Analysis	3
ISYE 6805	Reliability Engineering	3
ISYE 7400	Advanced Design of Experiments	3
ISYE 7405	Multivariate Data Analysis	3
ISYE 7406	Data Mining and Statistical Learning	3
Technical Electives (2 courses) [1,2]		
ISYE 6661	Linear Optimization	3
ISYE 6662	Discrete Optimization	3
ISYE 6663	Nonlinear Optimization	3
ISYE 6664	Stochastic Optimization	3
ISYE 6761	Stochastic Processes I	3
ISYE 6762	Stochastic Processes II	3
ISYE 6832	Simulation Theory and Methods	3
ISYE 6810	Systems Monitoring and Prognostics	3
ISYE 7204	Informatics in Production & Service Systems	3
MATH 6014	Graph Theory and Combinatorial Structures	3
MATH 6241	Probability I	3
MATH 6242	Probability II	3
MATH 6643	Numerical Linear Algebra	3
CS 6550	Design and Analysis of Algorithms	3
CS 7520	Approximation Algorithms	3
CS 7530	Randomized Algorithms	3

CS 7545	Theoretical Foundations of Machine Learning	3
ECE 6254	Statistical Machine Learning	3

All ten courses satisfying the above requirement in the Program of Study must be completed to obtain doctoral candidacy.

1 Other PhD-level Mathematics, Computer Science, or Machine Learning courses by permission of the Associate Chair for Graduate Studies
2 Two of the Technical Electives courses may double-count to the Minor if they are part of a cogent Minor approved by the Associate Chair for Graduate Studies

Comprehensive Exam
The comprehensive exam for the Statistics track is based on all four domain courses.

Economic Decision Analysis

Code	Title	Credit Hours
Operations Research Core (3 courses)		
ISYE 6661	Linear Optimization	3
ISYE 6662	Discrete Optimization	3
ISYE 6663	Nonlinear Optimization	3
ISYE 6761	Stochastic Processes I	3
Economic Decision Analysis Core (3 courses)		
ISYE 6225	Advanced Engineering Economy	3
ISYE 6230	Economic Decision Analysis	3
ISYE 8813	Special Topics in Operations Research (Game Theory)	3
ECON 7012	Microeconomic Theory I	3
ECON 7013	Microeconomic Theory II	3
Statistics Core (1 course)		
ISYE 6402	Time Series Analysis	3
ISYE 6421	Biostatistics	3
Breadth Elective (at least 1 course)		
ISYE 6227	Introduction to Financial Engineering	3
ISYE 6673	Financial Optimization Models	3
ISYE 6785	The Practice of Quantitative and Computational Finance	3
ISYE 7201	Production and Service Systems Engineering	3
ISYE 7203	Logistics Systems Engineering	3
HS 6000	Introduction to Healthcare Delivery	3
CS 7525	Algorithmic Game Theory and Economics	3
Technical Elective (2 courses) [1,2]		

1 Decided in consultation with advisor.
2 Up to two technical electives may double-count toward satisfying the minor requirement

Comprehensive Exam
The Economic Decision Analysis comprehensive exam has two parts:

1. Written exam: Students have to select any two courses from Group 1 methodology core of Economic Decision Analysis track. They are required to solve one question each from these 2 topics. Both questions are to be solved in one three hour exam.
2. Research paper: The research paper must be submitted by the day of the exam. The paper must be:
   - Written 100% by the student. (The student may mention the name of faculty/student collaborator.)
   - No more than 10 pages (excluding references), font size 11, margin at least 1 inch.
   - The first page should contain the title, the research collaborators, and a short abstract.
   - The introduction should be a broadly accessible to a non-expert and contain exposition of the main goals, ideas and techniques, including motivation and a clear literature survey (The entire paper can be a literature survey paper).

System Informatics and Control

Code	Title	Credit Hours
Domain Core (3 courses)		
ISYE 6810	Systems Monitoring and Prognostics	3
ISYE 7201	Production and Service Systems Engineering	3
ISYE 7204	Informatics in Production & Service Systems	3
or ISYE 640	Statistical Methods for Manufacturing Design and Improvement	
Methods Core (3 courses)		
ISYE 6661	Linear Optimization	3
ISYE 6761	Stochastic Processes I	3
ISYE 7406	Data Mining and Statistical Learning	3
Methods Breadth (4 or more courses)		
Select courses from two or more of the six focus areas:		
Stochastics and Simulation		
ISYE 6644	Simulation	3
ISYE 6832	Simulation Theory and Methods	3
ISYE 6656	Queuing Theory	3
ISYE 6762	Stochastic Processes II	3
Statistics		
ISYE 6402	Time Series Analysis	3
ISYE 6405	Statistical Methods for Manufacturing Design and Improvement	3
ISYE 6412	Theoretical Statistics	3
ISYE 6413	Design and Analysis of Experiments	3
ISYE 6420	Introduction to Theory and Practice of Bayesian Statistics	3
ISYE 7401	Advanced Statistical Modeling	3
ISYE 7405	Multivariate Data Analysis	3
ECE 6555	Optimal Estimation	3
Computing and Algorithms		
ISYE 6679	Computational Methods in Optimization	3
ISYE 6416	Computational Statistics	3
CS 6550	Design and Analysis of Algorithms	3
Dynamics and Control		
ECE 6120	Automata Theory	3
ECE 6550	Linear Systems and Controls	3
ECE 6551	Digital Control	3
ECE 6552	Nonlinear Systems and Control	3
ECE 6553	Optimal Control and Optimization	3

ECE 6554	Adaptive Control	3
ECE 6556	Intelligent Control	3
ECE 6559	Advanced Linear Systems	3
ME 6401	Linear Control Systems	3
ME 6402	Nonlinear Control Systems	3
ME 6403	Digital Control Systems	3
ME 6404	Advanced Control System Design and Implementation	3
ME 6443	Variational Methods in Engineering	3
Optimization		
ISYE 6662	Discrete Optimization	3
ISYE 6663	Nonlinear Optimization	3
ISYE 6664	Stochastic Optimization	3
Applications		
ISYE 6201	Manufacturing Systems	3
ISYE 6202	Warehousing Systems	3
ISYE 6203	Transportation and Supply Chain Systems	3
ECE 6557	Manufacturing Systems Design	3
ME 6222	Manufacturing Processes and Systems	3
ME 6223	Automated Manufacturing Process Planning	3
ME 6225	Metrology and Measurement Systems	3
ME 6754	Engineering Database Management Systems	3

Comprehensive Exam
The comprehensive exam for System Informatics and Control is based on all three domain courses.

Dissertation Research Proposal (for all tracks)

The first step toward completing a final dissertation is to receive formal approval of a dissertation research topic. This is accomplished via the Dissertation Research Proposal. Students must present their dissertation research proposal to the Thesis Advisory Committee no later than the end of Spring semester of the student's third full year in the program.

Each Ph.D. student must prepare a cogent, self-contained written research proposal that should describe the research to be addressed, demonstrate an understanding of existing work, describe intended research approaches, and present initial and anticipated results. The student must deliver this proposal, along with an oral presentation, to his/her committee. The content expected in the written research proposal should be discussed with the research advisor and committee members.

If judged to be satisfactory, the Thesis Advisory Committee members must sign the appropriate section of the Request for Admission to Ph.D. Candidacy form approving the thesis topic. Each member of the committee must also complete the Dissertation Proposal

Assessment Form, available on the ISyE website. The student should bring copies of all forms to the proposal presentation and is responsible for returning all forms to the Academic Programs Office. A student must present the thesis proposal at least one semester prior to the Final Doctoral Examination.

A student who fails to obtain approval of his/her thesis proposal must modify the existing proposal, and if required by the Thesis Advisory Committee, must defend the modified proposal in a subsequent oral presentation. If this second thesis proposal is not successful, the student will have not more than 6 months to identify a new research topic and if necessary a new research advisor, and to report this information to the Associate Chair for Graduate Studies. Failing to do so will prevent a student from continuing in the program.

Dissertation (for all tracks)

The primary requirement of a Ph.D. program is the completion of a dissertation, a written work documenting the research findings of a searching and authoritative investigation of a topic in the chosen primary field of study. The dissertation must either extend the boundaries of fundamental knowledge in a field or provide a new and better understanding or interpretation of facts already known. It should demonstrate that the candidate possesses powers of original thought, a talent for scholarship and research, and an ability to organize and present his/her findings.

Georgia Tech Graduate Studies maintains a website that discusses policies and requirements for Ph.D. dissertations at Georgia Tech.

Minor (for all tracks)

The minor will follow the standard Georgia Tech requirement: 6 hours outside the student's home unit with a letter grade of 'C' or higher. The courses for the minor should form a cohesive program of study that is approved by the ACGS. Courses selected from the breadth requirements can be used to count toward the Minor.

Doctor of Philosophy with a Major in Industrial Engineering - System Informatics & Control Track

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

Students in the Ph.D. with a major in Industrial Engineering program choose a single track from: General Industrial Engineering, Supply Chain Engineering, Statistics, Economic Decision Analysis, and System Informatics & Control.

Each track has specific course requirements. Students are expected to complete the course programs described below prior to candidacy, and many of the courses are recommended to be completed prior to the comprehensive examination. Students seeking to waive a program course requirement must receive permission from the Associate Chair for Graduate Studies. It is not our intent to have students repeat coursework that they may have already mastered during prior graduate degree programs, so please ask for appropriate waivers.

General Industrial Engineering

Code	Title	Credit Hours
Methodology Core (4 courses)		
Group 1 (at least 2 courses)		
ISYE 6661	Linear Optimization	3
ISYE 6662	Discrete Optimization	3
ISYE 6761	Stochastic Processes I	3
ISYE 6832	Simulation Theory and Methods	3
ISYE 6412	Theoretical Statistics	3
ISYE 6414	Statistical Modeling and Regression Analysis	3
ISYE 6416	Computational Statistics	3

ISYE 6740	Computational Data Analysis: Learning, Mining, and Computation	3
Group 2		
ECON 7012	Microeconomic Theory I	3
ECON 7013	Microeconomic Theory II	3
CSE 6140	Computational Science and Engineering Algorithms	3
CS 6550	Design and Analysis of Algorithms	3
ISYE 6402	Time Series Analysis	3
ISYE 6412	Theoretical Statistics	3
ISYE 6413	Design and Analysis of Experiments	3
ISYE 6420	Introduction to Theory and Practice of Bayesian Statistics	3
ISYE 6663	Nonlinear Optimization	3
ISYE 6664	Stochastic Optimization	3
ISYE 6679	Computational Methods in Optimization	3
ISYE 6761	Stochastic Processes I	3
ISYE 7401	Advanced Statistical Modeling	3
ISYE 7405	Multivariate Data Analysis	3
ISYE 7406	Data Mining and Statistical Learning	3
ISYE 7661	Theory of Linear Inequalities	3
ISYE 7682	Convexity	3
ISYE 7683	Advanced Nonlinear Programming	3
ISYE 7686	Advanced Combinatorial Optimization	3
ISYE 7687	Advanced Integer Programming	3
ISYE 8813	Special Topics in Operations Research (Constraint Programming)	3
ISYE 8813	Special Topics in Operations Research (Game Theory)	3
Domain Core (at least 3 courses)		
HS 6000	Introduction to Healthcare Delivery	3
ISYE 6201	Manufacturing Systems	3
ISYE 6202	Warehousing Systems	3
ISYE 6203	Transportation and Supply Chain Systems	3
ISYE 6225	Advanced Engineering Economy	3
ISYE 6227	Introduction to Financial Engineering	3
ISYE 6230	Economic Decision Analysis	3
ISYE 6320	Public Impact Applications of Operations Research and Management Science	3
ISYE 6421	Biostatistics	3
ISYE 6673	Financial Optimization Models	3
ISYE 6785	The Practice of Quantitative and Computational Finance	3
ISYE 7201	Production and Service Systems Engineering	3
ISYE 7203	Logistics Systems Engineering	3
ISYE 7205	Inventory Theory	3
ISYE 8813	Special Topics in Operations Research (On Life Cycle Assessment)	3
Technical Elective (3 courses) [1,2]		

1 Decided in consultation with advisor.

2 Up to two technical electives may double-count toward satisfying the minor requirement

Comprehensive Exam

The General Industrial Engineering comprehensive exam has two parts:

1. Written exam: Students have to select any two courses from Group 1 methodology core of General Industrial Engineering track. They are required to solve one question each from these 2 topics. Both questions are to be solved in one three hour exam.
2. Research paper: The research paper must be submitted by the day of the exam. The paper must be:

- Written 100% by the student. (The student may mention the name of faculty/student collaborator.)
- No more than 10 pages (excluding references), font size 11, margin at least 1 inch.
- The first page should contain the title, the research collaborators, and a short abstract.
- The introduction should be a broadly accessible to a non-expert and contain exposition of the main goals, ideas and techniques, including motivation and a clear literature survey (The entire paper can be a literature survey paper).

Supply Chain Engineering

Code	Title	Credit Hours
Methodology Core (4 courses)		
Group 1 (at least 2 courses)		
ISYE 6661	Linear Optimization	3
ISYE 6662	Discrete Optimization	3
ISYE 6761	Stochastic Processes I	3
ISYE 6832	Simulation Theory and Methods	3
Group 2		
ISYE 6230	Economic Decision Analysis	3
ISYE 6412	Theoretical Statistics	3
ISYE 6414	Statistical Modeling and Regression Analysis	3
ISYE 6663	Nonlinear Optimization	3
ISYE 6664	Stochastic Optimization	3
ISYE 6740	Computational Data Analysis: Learning, Mining, and Computation	3
ISYE 7682	Convexity	3
ISYE 7683	Advanced Nonlinear Programming	3
ISYE 7686	Advanced Combinatorial Optimization	3
ISYE 7687	Advanced Integer Programming	3
ISYE 8813	Special Topics in Operations Research (Constraint Programming)	3
Domain Core (3 courses)		
Group 1 (at least 2 courses)		
ISYE 6202	Warehousing Systems	3
ISYE 7201	Production and Service Systems Engineering	3
ISYE 7203	Logistics Systems Engineering	3
ISYE 7205	Inventory Theory	3
Group 2		
ISYE 6201	Manufacturing Systems	3
ISYE 6203	Transportation and Supply Chain Systems	3
ISYE 6320	Public Impact Applications of Operations Research and Management Science	3
Computational Core (1 course) [1]		

ISYE 6679	Computational Methods in Optimization	3
CSE 6140	Computational Science and Engineering Algorithms	3
CS 6550	Design and Analysis of Algorithms	3
Technical Elective (2 courses) [2,3]		

1 Computational core may be chosen from the list above or can be other graduate-level courses related to the major area of study.
2 Decided in consultation with advisor.
3 Up to two technical electives may double-count toward satisfying the minor requirement

Comprehensive Exam
The Supply Chain Engineering comprehensive exam has two parts:

1. Written exam: Students have to select any two courses from Group 1 methodology core of Supply Chain Engineering track. They are required to solve one question each from these 2 topics. Both questions are to be solved in one three hour exam.
2. Research paper: The research paper must be submitted by the day of the exam. The paper must be:
   - Written 100% by the student. (The student may mention the name of faculty/student collaborator.)
   - No more than 10 pages (excluding references), font size 11, margin at least 1 inch.
   - The first page should contain the title, the research collaborators, and a short abstract.
   - The introduction should be a broadly accessible to a non-expert and contain exposition of the main goals, ideas and techniques, including motivation and a clear literature survey (The entire paper can be a literature survey paper).

Statistics

Code	Title	Credit Hours
Domain Core (4 courses)		
ISYE 6412	Theoretical Statistics	3
ISYE 6413	Design and Analysis of Experiments	3
ISYE 6416	Computational Statistics	3
ISYE 7401	Advanced Statistical Modeling	3
Statistics Electives (4 courses)		
ISYE 6402	Time Series Analysis	3
ISYE 6404	Nonparametric Data Analysis	3
ISYE 6420	Introduction to Theory and Practice of Bayesian Statistics	3
ISYE 6421	Biostatistics	3
ISYE 6740	Computational Data Analysis: Learning, Mining, and Computation	3
ISYE 6781	Reliability Theory	3
ISYE 6783	Statistical Techniques of Financial Data Analysis	3
ISYE 6805	Reliability Engineering	3
ISYE 7400	Advanced Design of Experiments	3
ISYE 7405	Multivariate Data Analysis	3
ISYE 7406	Data Mining and Statistical Learning	3
Technical Electives (2 courses) [1,2]		
ISYE 6661	Linear Optimization	3
ISYE 6662	Discrete Optimization	3
ISYE 6663	Nonlinear Optimization	3
ISYE 6664	Stochastic Optimization	3
ISYE 6761	Stochastic Processes I	3
ISYE 6762	Stochastic Processes II	3
ISYE 6832	Simulation Theory and Methods	3
ISYE 6810	Systems Monitoring and Prognostics	3
ISYE 7204	Informatics in Production & Service Systems	3
MATH 6014	Graph Theory and Combinatorial Structures	3
MATH 6241	Probability I	3
MATH 6242	Probability II	3
MATH 6643	Numerical Linear Algebra	3
CS 6550	Design and Analysis of Algorithms	3
CS 7520	Approximation Algorithms	3
CS 7530	Randomized Algorithms	3
CS 7545	Theoretical Foundations of Machine Learning	3
ECE 6254	Statistical Machine Learning	3

All ten courses satisfying the above requirement in the Program of Study must be completed to obtain doctoral candidacy.

1 Other PhD-level Mathematics, Computer Science, or Machine Learning courses by permission of the Associate Chair for Graduate Studies
2 Two of the Technical Electives courses may double-count to the Minor if they are part of a cogent Minor approved by the Associate Chair for Graduate Studies

Comprehensive Exam
The comprehensive exam for the Statistics track is based on all four domain courses.

Economic Decision Analysis

Code	Title	Credit Hours
Operations Research Core (3 courses)		
ISYE 6661	Linear Optimization	3
ISYE 6662	Discrete Optimization	3
ISYE 6663	Nonlinear Optimization	3
ISYE 6761	Stochastic Processes I	3
Economic Decision Analysis Core (3 courses)		
ISYE 6225	Advanced Engineering Economy	3
ISYE 6230	Economic Decision Analysis	3
ISYE 8813	Special Topics in Operations Research (Game Theory)	3
ECON 7012	Microeconomic Theory I	3
ECON 7013	Microeconomic Theory II	3
Statistics Core (1 course)		
ISYE 6402	Time Series Analysis	3
ISYE 6421	Biostatistics	3
Breadth Elective (at least 1 course)		
ISYE 6227	Introduction to Financial Engineering	3
ISYE 6673	Financial Optimization Models	3
ISYE 6785	The Practice of Quantitative and Computational Finance	3
ISYE 7201	Production and Service Systems Engineering	3

ISYE 7203	Logistics Systems Engineering	3
HS 6000	Introduction to Healthcare Delivery	3
CS 7525	Algorithmic Game Theory and Economics	3
Technical Elective (2 courses) [1,2]		

1 Decided in consultation with advisor.
2 Up to two technical electives may double-count toward satisfying the minor requirement

Comprehensive Exam
The Economic Decision Analysis comprehensive exam has two parts:

1. Written exam: Students have to select any two courses from Group 1 methodology core of Economic Decision Analysis track. They are required to solve one question each from these 2 topics. Both questions are to be solved in one three hour exam.
2. Research paper: The research paper must be submitted by the day of the exam. The paper must be:
   - Written 100% by the student. (The student may mention the name of faculty/student collaborator.)
   - No more than 10 pages (excluding references), font size 11, margin at least 1 inch.
   - The first page should contain the title, the research collaborators, and a short abstract.
   - The introduction should be a broadly accessible to a non-expert and contain exposition of the main goals, ideas and techniques, including motivation and a clear literature survey (The entire paper can be a literature survey paper).

System Informatics and Control

Code	Title	Credit Hours
Domain Core (3 courses)		
ISYE 6810	Systems Monitoring and Prognostics	3
ISYE 7201	Production and Service Systems Engineering	3
ISYE 7204	Informatics in Production & Service Systems	3
or ISYE 640	Statistical Methods for Manufacturing Design and Improvement	
Methods Core (3 courses)		
ISYE 6661	Linear Optimization	3
ISYE 6761	Stochastic Processes I	3
ISYE 7406	Data Mining and Statistical Learning	3
Methods Breadth (4 or more courses)		
Select courses from two or more of the six focus areas:		
Stochastics and Simulation		
ISYE 6644	Simulation	3
ISYE 6832	Simulation Theory and Methods	3
ISYE 6656	Queuing Theory	3
ISYE 6762	Stochastic Processes II	3
Statistics		
ISYE 6402	Time Series Analysis	3
ISYE 6405	Statistical Methods for Manufacturing Design and Improvement	3
ISYE 6412	Theoretical Statistics	3
ISYE 6413	Design and Analysis of Experiments	3
ISYE 6420	Introduction to Theory and Practice of Bayesian Statistics	3
ISYE 7401	Advanced Statistical Modeling	3
ISYE 7405	Multivariate Data Analysis	3
ECE 6555	Optimal Estimation	3
Computing and Algorithms		
ISYE 6679	Computational Methods in Optimization	3
ISYE 6416	Computational Statistics	3
CS 6550	Design and Analysis of Algorithms	3
Dynamics and Control		
ECE 6120	Automata Theory	3
ECE 6550	Linear Systems and Controls	3
ECE 6551	Digital Control	3
ECE 6552	Nonlinear Systems and Control	3
ECE 6553	Optimal Control and Optimization	3
ECE 6554	Adaptive Control	3
ECE 6556	Intelligent Control	3
ECE 6559	Advanced Linear Systems	3
ME 6401	Linear Control Systems	3
ME 6402	Nonlinear Control Systems	3
ME 6403	Digital Control Systems	3
ME 6404	Advanced Control System Design and Implementation	3
ME 6443	Variational Methods in Engineering	3
Optimization		
ISYE 6662	Discrete Optimization	3
ISYE 6663	Nonlinear Optimization	3
ISYE 6664	Stochastic Optimization	3
Applications		
ISYE 6201	Manufacturing Systems	3
ISYE 6202	Warehousing Systems	3
ISYE 6203	Transportation and Supply Chain Systems	3
ECE 6557	Manufacturing Systems Design	3
ME 6222	Manufacturing Processes and Systems	3
ME 6223	Automated Manufacturing Process Planning	3
ME 6225	Metrology and Measurement Systems	3
ME 6754	Engineering Database Management Systems	3

Comprehensive Exam
The comprehensive exam for System Informatics and Control is based on all three domain courses.

Dissertation Research Proposal (for all tracks)

The first step toward completing a final dissertation is to receive formal approval of a dissertation research topic. This is accomplished via the Dissertation Research Proposal. Students must present their dissertation research proposal to the Thesis Advisory Committee no later than the end of Spring semester of the student's third full year in the program.

Each Ph.D. student must prepare a cogent, self-contained written research proposal that should describe the research to be addressed, demonstrate an understanding of existing work, describe intended research approaches, and present initial and anticipated results. The student must deliver this proposal, along with an oral presentation, to his/

her committee. The content expected in the written research proposal should be discussed with the research advisor and committee members.

If judged to be satisfactory, the Thesis Advisory Committee members must sign the appropriate section of the Request for Admission to Ph.D. Candidacy form approving the thesis topic. Each member of the committee must also complete the Dissertation Proposal

Assessment Form, available on the ISyE website. The student should bring copies of all forms to the proposal presentation and is responsible for returning all forms to the Academic Programs Office. A student must present the thesis proposal at least one semester prior to the Final Doctoral Examination.

A student who fails to obtain approval of his/her thesis proposal must modify the existing proposal, and if required by the Thesis Advisory Committee, must defend the modified proposal in a subsequent oral presentation. If this second thesis proposal is not successful, the student will have not more than 6 months to identify a new research topic and if necessary a new research advisor, and to report this information to the Associate Chair for Graduate Studies. Failing to do so will prevent a student from continuing in the program.

Dissertation (for all tracks)

The primary requirement of a Ph.D. program is the completion of a dissertation, a written work documenting the research findings of a searching and authoritative investigation of a topic in the chosen primary field of study. The dissertation must either extend the boundaries of fundamental knowledge in a field or provide a new and better understanding or interpretation of facts already known. It should demonstrate that the candidate possesses powers of original thought, a talent for scholarship and research, and an ability to organize and present his/her findings.

Georgia Tech Graduate Studies maintains a website that discusses policies and requirements for Ph.D. dissertations at Georgia Tech.

Minor (for all tracks)

The minor will follow the standard Georgia Tech requirement: 6 hours outside the student's home unit with a letter grade of 'C' or higher. The courses for the minor should form a cohesive program of study that is approved by the ACGS. Courses selected from the breadth requirements can be used to count toward the Minor.

DOCTOR OF PHILOSOPHY WITH A MAJOR IN INTERNATIONAL AFFAIRS, SCIENCE AND TECHNOLOGY

The Nunn School International Affair's Ph.D. program provides an unparalleled opportunity for students with backgrounds in either politics or science and technology to deepen their understanding of international affairs through the advanced study of sub-fields such as international relations theory, international security, international political economy, comparative politics, and methods for social scientific research.

The Ph.D. program is a four to six-year program designed to adapt to the interests and needs of students who intend to enter professional careers requiring or who plan to work in academia. The program emphasizes both traditional theoretical knowledge of international relations and strategic planning and analysis.

As part of the coursework, students are required to demonstrate foreign language familiarity through two years of coursework during undergraduate or graduate studies and passing a translation exercise. Students can either opt to have a third year of language or take a year of advanced methods. Students are required to pass two qualification exams and successfully defend a paper related to a science and technology topic before they can advance to candidacy.

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

The PhD program is founded upon a broad, rigorous, and student-centered curriculum. All students must complete INTA 6102 and INTA 6003. Because students come from a wide range of backgrounds, they may petition to substitute or pass-out of certain core requirements based upon previous experiences and coursework and under the guidance and approval of the dissertation committee. However, reduction in credit is limited to a total of nine credit hours.

Code	Title	Credit Hours
Required Courses		
INTA 6102	International Relations Theory	3
INTA 6003	Empirical Research Methods	3
INTA 9000	Doctoral Thesis	18
Core Courses		
INTA 8010	International Affairs, Science and Technology Ph.D. Proseminar	1
INTA 8000	Seminar in Science, Technology and International Affairs I	3
INTA 8001	Seminar in Science, Technology and International Affairs II	3
Concentation Tracks		
Each of the predesigned tracks includes a core class and two electives. These tracks are considered core classes and must be completed before examinations.		
Select two of four concentration tracks from the following:		18
International Affairs and Security		
Globalization and Development		
Comparative and Regional Studies		
Student-created (Unique Track): Graduate Program Director- and Faculty-approved Track		
Minor		
Select three related INTA 6000/8000-level courses. [1]		9
Advanced Methods or Language Requirement		
Advanced Methods or Language Requirement [2]		0-18
Total Credit Hours		**58-76**

[1] Students must complete a minor concentration that focuses on an approved topic in the field of science, technology, and international affairs. This may be satisfied by completing three related INTA courses at the 6000 and 8000 levels in international innovation or security or three courses in other Schools of the Ivan Allen College, or in colleges or interdisciplinary fields of the Institute or elsewhere.

[2] Students must also satisfy either the language or advanced methods requirement. The language requirement is satisfied through demonstrated competency (reading proficiency only) in one language other than English (equivalent of four semesters of college-level coursework or an equivalent exam). The advanced methods requirement may be satisfied through completion of two semesters of coursework (in addition to core requirements) of advanced statistics, methods, and/or computer science taken either within the School or in other colleges of the Institute.

Breakdown of Hours Required for Degree

Code	Title	Credit Hours
INTA 9000	Doctoral Thesis	18
INTA 6102	International Relations Theory	3
INTA 6003	Empirical Research Methods	3
INTA 8010	International Affairs, Science and Technology Ph.D. Proseminar	1
INTA 8000/8001	Seminar in Science, Technology and International Affairs I	6
Track courses		18
Minor concentration		9
Advanced Methods or Language Requirement		0-18
Total Credit Hours		**58-76**

Other requirements for the PhD include admission to candidacy for the degree through a qualification process that includes successful completion of two comprehensive examinations in specified fields of international affairs; submission and oral defense of a Science, Technology, and International Affairs Field Exam Paper on an approved topic; and submission and defense of a dissertation prospectus that must be approved and supervised by the dissertation committee composed of relevant experts in the fields and a member external to the school. Finally, students must complete and successfully defend a doctoral dissertation.

DOCTOR OF PHILOSOPHY WITH A MAJOR IN MACHINE LEARNING

The Doctor of Philosophy with a major in Machine Learning program has the following principal objectives, each of which supports an aspect of the Institute's mission:

1. Create students that are able to advance the state of knowledge and practice in machine learning through innovative research contributions.
2. Create students who are able to integrate and apply principles from computing, statistics, optimization, engineering, mathematics and science to innovate, and create machine learning models and apply them to solve important real-world data intensive problems.
3. Create students who are able to participate in multidisciplinary teams that include individuals whose primary background is in statistics, optimization, engineering, mathematics and science.
4. Provide a high quality education that prepares individuals for careers in industry, government (e.g., national laboratories), and academia, both in terms of knowledge, computational (e.g., software development) skills, and mathematical modeling skills.
5. Foster multidisciplinary collaboration among researchers and educators in areas such as computer science, statistics, optimization, engineering, social science, and computational biology.
6. Foster economic development in the state of Georgia.
7. Advance Georgia Tech's position of academic leadership by attracting high quality students who would not otherwise apply to Tech for graduate study.

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

The central goal of the PhD program is to train students to perform original, independent research. The most important part of the curriculum is the successful defense of a PhD Dissertation, which demonstrates this research ability. The academic requirements are designed in service of this goal.

The curriculum for the PhD in Machine Learning is truly multidisciplinary, containing courses taught in nine schools across three colleges at Georgia Tech: the Schools of Computational Science and Engineering, Computer Science, and Interactive Computing in the College of Computing; the Schools of Aerospace Engineering, Chemical and Biomolecular Engineering, Industrial and Systems Engineering, Electrical and Computer Engineering, and Biomedical Engineering in the College of Engineering; and the School of Mathematics in the College of Science.

Summary of General Requirements for a PhD in Machine Learning

- Core curriculum (4 courses, 12 hours). Machine Learning PhD students will be required to complete courses in four different areas: Mathematical Foundations, Probabilistic and Statistical Methods in Machine Learning, ML Theory and Methods, and Optimization.
- Area electives (5 courses, 15 hours).
- Responsible Conduct of Research (RCR) (1 course, 1 hour, pass/fail). Georgia Tech requires that all PhD students complete an RCR requirement that consists of an online component and in-person training. The online component is completed during the student's first semester enrolled at Georgia Tech. The in-person training is satisfied by taking PHIL 6000 or their associated academic program's in-house RCR course.
- Qualifying examination (1 course, 3 hours). This consists of a one-semester independent literature review followed by an oral examination.
- Doctoral minor (2 courses, 6 hours).
- Research Proposal. The purpose of the proposal is to give the faculty an opportunity to give feedback on the student's research direction, and to make sure they are developing into able communicators.
- PhD Dissertation.

Almost all of the courses in both the core and elective categories are already taught regularly at Georgia Tech. However, two core courses (designated in the next section) are being developed specifically for this program. The proposed outlines for these courses can be found in the Appendix. Students who complete these required courses as part of a master's program will not need to repeat the courses if they are admitted to the ML PhD program.

Core Courses

Machine Learning PhD students will be required to complete courses in four different areas. With the exception of the Foundations course, each of these area requirements can be satisfied using existing courses from the College of Computing or Schools of ECE, ISyE, and Mathematics.

Machine Learning core:

Mathematical Foundations of Machine Learning. This required course is the gateway into the program, and covers the key subjects from applied mathematics needed for a rigorous graduate program in ML. Particular emphasis will be put on advanced concepts in linear algebra and probabilistic modeling. This course is cross-listed between CS, CSE, ECE, and ISyE.

ECE 7750/ISYE 7750/CS 7750/CSE 7750 Mathematical Foundations of Machine Learning

Probabilistic and Statistical Methods in Machine Learning

- ISYE 6412, Theoretical Statistics
- ECE 7751/ISYE 7751/CS 7751/CSE 7751 Probabilistic Graphical Models
- MATH 7251 High Dimension Probability
- MATH 7252 High Dimension Statistics

Machine Learning: Theory and Methods. This course serves as an introduction to the foundational problems, algorithms, and modeling techniques in machine learning. Each of the courses listed below treats roughly the same material using a mix of applied mathematics and computer science, and each has a different balance between the two.

- CS 7545 Machine Learning Theory and Methods
- CS 7616, Pattern Recognition
- CSE 6740/ISYE 6740, Computational Data Analysis
- ECE 6254, Statistical Machine Learning
- ECE 6273, Methods of Pattern Recognition with Applications to Voice

Optimization. Optimization plays a crucial role in both developing new machine learning algorithms and analyzing their performance. The three courses below all provide a rigorous introduction to this topic;

each emphasizes different material and provides a unique balance of mathematics and algorithms.

- ECE 8823, Convex Optimization: Theory, Algorithms, and Applications
- ISYE 6661, Linear Optimization
- ISYE 6663, Nonlinear Optimization
- ISYE 7683, Advanced Nonlinear Programming

Electives

After core requirements are satisfied, all courses listed in the core not already taken can be used as (appropriately classified) electives.

In addition to meeting the core area requirements, each student is required to complete five elective courses. These courses are required for getting a complete breadth in ML. These courses must be chosen from at least two of the five subject areas listed below. In addition, students can use up to six special problems research hours to satisfy this requirement.

i. **Statistics and Applied Probability**: To build breadth and depth in the areas of statistics and probability as applied to ML.

- AE 6505, Kalman Filtering
- BMED 6700, Biostatistics
- ECE 6558, Stochastic Systems
- ECE 6601, Random Processes
- ECE 6605, Information Theory
- ISYE 6404, Nonparametric Data Analysis
- ISYE 6413, Design and Analysis of Experiments
- ISYE 6414, Regression Analysis
- ISYE 6416, Computational Statistics
- ISYE 6420, Bayesian Statistics
- ISYE 6761, Stochastic Processes I
- ISYE 6762, Stochastic Processes II
- ISYE 7400, Adv Design-Experiments
- ISYE 7401, Adv Statistical Modeling
- ISYE 7405, Multivariate Data Analysis
- ISYE 8803, Statistical and Probabilistic Methods for Data Science
- ISYE 8813, Special Topics in Data Science
- MATH 6263, Testing Statistical Hypotheses
- MATH 6266, Statistical Linear Modeling
- MATH 6267, Multivariate Statistical Analysis
- MATH 7244, Stochastic Processes and Stochastic Calculus I
- MATH 7245, Stochastic Processes and Stochastic Calculus II

ii. **Advanced Theory:** To build a deeper understanding of foundations of ML.

- CS 7280, Network Science
- CS 7510, Graph Algorithms
- CS 7520, Approximation Algorithms
- CS 7530, Randomized Algorithms
- CS 7535, Markov Chain Monte Carlo Algorithms
- CS 7540, Spectral Algorithms
- CS 8803, Continuous Algorithms
- ECE 6283, Harmonic Analysis and Signal Processing
- ECE 6555, Linear Estimation
- ISYE 7682, Convexity
- MATH 6112, Advanced Linear Algebra
- MATH 6221, Advanced Classical Probability Theory
- MATH 6241, Probability I
- MATH 6580, Introduction to Hilbert Space
- MATH 7338, Functional Analysis
- MATH 7586, Tensor Analysis
- MATH 88XX, Special Topics: High Dimensional Probability and Statistics

iii. **Applications:** To develop a breadth and depth in variety of applications domains impacted by/with ML.

- AE 6373, Advanced Design Methods
- AE 8803, Machine Learning for Control Systems
- AE 8803, Nonlinear Stochastic Optimal Control
- BMED 6780, Medical Image Processing
- BMED 8813BHI, Biomedical and Health Informatics
- BMED 8813MHI, mHealth Informatics
- BMED 8813MLB, Machine Learning in Biomedicine
- BMED 8823ALG, OMICS Data and Bioinformatics Algorithms
- CS 6440, Introduction to Health Informatics
- CS 6465, Computational Journalism
- CS 6471, Computational Social Science
- CS 6474, Social Computing
- CS 6475, Computational Photography
- CS 6476, Computer Vision
- CS 6601, Artificial Intelligence
- CS 7450, Information Visualization
- CS 7476, Advanced Computer Vision
- CS 7630, Autonomous Robots
- CS 7632, Game AI
- CS 7636, Computational Perception
- CS 7643, Deep Learning
- CS 7646, Machine Learning for Trading
- CS 7650, Natural Language Processing
- CSE 6141, Massive Graph Analysis
- CSE 6240, Web Search and Text Mining
- CSE 6242, Data and Visual Analytics
- CSE 6301, Algorithms in Bioinformatics and Computational Biology
- ECE 4580, Computational Computer Vision
- ECE 6255, Digital Processing of Speech Signals
- ECE 6258, Digital Image Processing
- ECE 6260, Data Compression and Modeling
- ECE 6273, Methods of Pattern Recognition with Application to Voice
- ECE 6550, Linear Systems and Controls
- ECE 8813, Network Security
- ISYE 6421, Biostatistics
- ISYE 6810, Systems Monitoring and Prognosis
- ISYE 7201, Production Systems
- ISYE 7204, Info Prod & Ser Sys
- ISYE 7203, Logistics Systems
- ISYE 8813, Supply Chain Inventory Theory
- HS 6000, Healthcare Delivery

- MATH 6759, Stochastic Processes in Finance
- MATH 6783, Financial Data Analysis

iv. Computing and Optimization: To provide more breadth and foundation in areas of math, optimization and computation for ML.

- CS 6515, Introduction to Graduate Algorithms
- CS 6550, Design and Analysis of Algorithms
- CSE 6140, Computational Science and Engineering Algorithms
- CSE 6643, Numerical Linear Algebra
- CSE 6644, Iterative Methods for Systems of Equations
- CSE 6710, Numerical Methods I
- CSE 6711, Numerical Methods II
- ISYE 6644, Simulation
- ISYE 6645, Monte Carlo Methods
- ISYE 6662, Discrete Optimization
- ISYE 6664, Stochastic Optimization
- ISYE 6679, Computational methods for optimization
- ISYE 7686, Advanced Combinatorial Optimization
- ISYE 7687, Advanced Integer Programming

v. **Platforms**: To provide breadth and depth in computing platforms that support ML and Computation.

- CS 6421, Temporal, Spatial, and Active Databases
- CS 6430, Parallel and Distributed Databases
- CS 6290, High-Performance Computer Architecture
- CSE 6220, High Performance Computing
- CSE 6230, High Performance Parallel Computing

Qualifying Examination

The purpose of the Qualifying Examination is to judge the candidate's potential as an independent researcher.

The Ph.D. qualifying exam consists of a focused literature review that will take place over the course of one semester. At the beginning of the second semester of their second year, a qualifying committee consisting of three members of the ML faculty will assign, in consultation with the student and the student's advisor, a course of study consisting of influential papers, books, or other intellectual artifacts relevant to the student's research interests. The student's focus area and current research efforts (and related portfolio) will be considered in defining the course of study.

At the end of the semester, the student will submit a written summary of each artifact which highlights their understanding of the importance (and weaknesses) of the work in question and the relationship of this work to their current research. Subsequently, the student will have a closed oral exam with the three members of the committee. The exam will be interactive, with the student and the committee discussing and criticizing each work and posing questions related the students current research to determine the breadth of student's knowledge in that specific area.

The success of the examination will be determined by the committee's qualitative assessment of the student's understanding of the theory, methods, and ultimate impact of the assigned syllabus.

The student will be given a passing grade for meeting the requirements of the committee in both the written and the oral part. Unsatisfactory performance on either part will require the student to redo the entire qualifying exam in the following semester year. Each student will be allowed only two attempts at the exam.

Students are expected to perform the review by the end of their second year in the program.

Doctoral Dissertation

The primary requirement of the PhD student is to do original and substantial research. This research is reported for review in the PhD dissertation, and presented at the final defense.
As the first step towards completing a dissertation, the student must prepare and defend a Research Proposal. The proposal is a document of no more than 20 pages in length that carefully describes the topic of the dissertation, including references to prior work, and any preliminary results to date. The written proposal is submitted to a committee of three faculty members from the ML PhD program, and is presented in a public seminar shortly thereafter. The committee members provide feedback on the proposed research directions, comments on the strength of writing and oral presentation skills, and might suggest further courses to solidify the student's background. Approval of the Research Proposal by the committee is required at least six months prior to the scheduling of the PhD defense. It is expected that the student complete this proposal requirement no later than their fourth year in the program.
The PhD thesis committee consists of five faculty members: the student's advisor, three additional members from the ML PhD program, and one faculty member external to the ML program. The committee is charged with approving the written dissertation and administering the final defense. The defense consists of a public seminar followed by oral examination from the thesis committee.

Doctoral minor (2 courses, 6 hours):

The minor follows the standard Georgia Tech requirement: 6 hours, preferably outside the student's home unit, with a GPA in those graduate-level courses of at least 3.0. The courses for the minor should form a cohesive program of study outside the area of Machine Learning; no ML core or elective courses may be used to fulfill this requirement and must be approved by your thesis advisor and ML Academic Advisor. Typical programs will consist of three courses two courses from the same school (any school at the Institute) or two courses from the same area of study.

DOCTOR OF PHILOSOPHY WITH A MAJOR IN MANAGEMENT

The PhD program in Management is designed to produce graduates who can make scholarly contributions to their chosen fields. Most graduates undertake careers as researchers, scholars, and teachers, in academic environments.

The doctoral program in the Scheller College of Business is intended for full-time students who will complete their entire doctoral program prior to leaving campus. Full-time residence in or near Atlanta is expected. The doctoral program is strongly research-oriented and emphasizes early and effective involvement in research, with students experiencing considerable personal attention and close interaction with faculty. The PhD program complements and reflects the technological emphasis of the Institute and places considerable weight on learning outside the classroom. The tutorial model is the basic educational approach employed throughout the program.

Applicants to the doctoral program in management should note that supplementary application materials are required by the College of Business in addition to those required by Georgia Tech's Office of Graduate Admissions and Enrollment Services.

Applications and viewbooks are available online at https://www.scheller.gatech.edu/degree-programs/phd

For more information, call the program office at 404.385.3896 or send an email to phd@scheller.gatech.edu.

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

Requirements

The central goal of the PhD program is to train students to perform original, independent research. The most important part of the curriculum is the successful defense of a PhD Dissertation, which demonstrates this research ability. The academic requirements are designed in service of this goal.

The curriculum for the PhD in Management offers seven concentration areas: Accounting, Finance, Marketing, Information Technology Management, Operations Management, Organizational Behavior, and Strategy & Innovation.

Summary of General Requirements for a PhD in Management

- Core curriculum courses (area of specialization, 18 credit hours). Management students will be required to complete courses foundational coursework in their assigned area.
- Electives (area of specialization, 12 credit hours).
- Responsible Conduct of Research (RCR) (1 course, 1 hour, pass/fail). Georgia Tech requires that all PhD students complete an RCR requirement that consists of an online component and in-person training. The online component is completed during the student's first semester enrolled at Georgia Tech. The in-person training is satisfied by taking PHIL 6000 or their associated academic program's in-house RCR course.
- Qualifying examination (1 course, 3 hours). This consists of a one-semester independent literature review followed by an oral examination.
- Doctoral minor (3 courses, 9 hours).
- Research Proposal. The purpose of the proposal is to give the faculty an opportunity to give feedback on the student's research direction, and to make sure they are developing into able communicators.
- PhD Dissertation.

Qualifying Examination

The student will be examined for knowledge in his/her field. The exam will be written and with the possibility of an additional oral component. The exam should be comprehensive in the student's field and may include a section on research methodology and quantitative methods.

Minor

The minor will follow the standard Georgia Tech requirement: 9 hours outside the student's home unit, with a GPA in those courses of at least 3.0. These courses are in addition to the other core and elective requirements. The courses for the minor should form a cohesive program of study, outside the area of ML, that is approved by the Faculty Advisory Committee. Typical programs will consist of three courses from the same school (any school at the Institute) or three courses from the same elective area in the courses listed above. The courses should all be from the same School or from the same elective area in the courses listed above. Programs that do not meet this criteria cannot be approved by the Graduate Committee.

Dissertation Proposal

The student will present a dissertation project proposal to a Thesis Advisory Committee

consisting of at least three persons, one of whom is the Thesis Advisor. The Thesis Advisory Committee provides advice and guidance during development of the research topic and conduct of the research and is charged with approving the thesis when the research is completed and presented as the doctoral thesis. There should be a written proposal to be approved by the thesis committee at least one semester before the defense. If the student pass and has completed all other requirements, he/she will be considered a "candidate" for the PhD degree. You will submit the *Request for Admission to PhD Candidacy* form.

Doctoral Dissertation

The primary requirement of the PhD student is to do original and substantial research. This research is reported for review in the PhD dissertation, and presented at the final defense. When the Thesis Advisory Committee considers the thesis to be satisfactory, a recommendation

for a Final Doctoral Examination Committee is made by the student and the Thesis Advisory Committee. The Final Doctoral Examination Committee consists of at least five individuals. At least one member of the Final Doctoral Examination Committee must be from outside the College of Business. According to Institute rules, members of the Thesis Advisory Committee must be members of the Final Doctoral Examination Committee. Dissertation research should be of sufficient quality and scope that it is publishable in refereed journals in the student's field. The candidate will make an oral presentation of the project and its findings in a colloquium open to the public. You will submit the *Certificate of Thesis*

Approval for Doctoral Students form when you successfully defend your dissertation.

DOCTOR OF PHILOSOPHY WITH A MAJOR IN MATERIALS SCIENCE AND ENGINEERING

The School of Materials Science and Engineering offers a program of study and research leading to the Doctor of Philosophy degree. The Ph.D. degree recognizes demonstrated proficiency and high achievement in research. Beyond mandatory core classes the students in the Ph.D. program pursue an individually structured study plan culminating in a dissertation that makes an original and substantial contribution to the fundamental knowledge in the field of study.

Students with a BS or MS degree in Materials Science and Engineering, Polymer Science and Engineering, Ceramic Engineering, Metallurgical Engineering, Chemical Engineering, Mechanical Engineering, Textile Engineering, Biomedical Engineering, Chemistry, Biology, Physics, or in a related field of science and engineering can be admitted in the Ph.D. program. Ph.D. admissions are generally granted with tuition waivers and financial assistance in the form of graduate research assistantships.

The MSE faculty have diverse research backgrounds and expertise in various areas of Materials Science and Engineering constituting three typical working groups: (a) Functional Materials, (b) Soft and Biomaterials, (c) Structural Materials, and spanning all forms and functions of materials. MSE students, research scientists, and faculty are currently engaged in research in the following general areas:

- *Polymers and Macromolecules*
- *Biologically Enabled and Bioinspired Materials*
- *Nanomaterials and Nanoengineered Devices*
- *Computational Design, Modeling, and Simulations*
- *Functional Electronic and Optical Materials*
- *Fibers and Composites*
- *Energy Storage and Harvesting*
- *Advanced Structural Materials*
- *Multi-scale Structural & Chemical Characterization*

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

When starting the Ph.D. program, students are considered to be 'probational' Ph.D. students, until they successfully complete the qualifying requirements at which point, they become 'candidate' Ph.D. students. The requirements for the Ph. D. candidacy are outlined below:

All graduate students starting their Ph.D. program are expected to take the core courses in the 1st year. Students must pass the three core courses (i.e. MSE 6411, MSE 6402, and MSE 6768). (If a student gets a "F" grade in a core course then they must retake that course and get a passing grade)

The total number of hours required for a Ph.D. depends on whether the student enters with a BS or suitable MS. Three credit hours toward a graduate degree may be taken for elective courses under the pass/fail system, only if the major school has approved the course prior to taking it. The rules for withdrawal from letter grade courses apply to pass/fail courses as well. Institute rules for the pass/fail system can be found at: http://www.catalog.gatech.edu/rules/10/ .

Code	Title	Credit Hours
Core Courses		
MSE 6411	Thermodynamics of Materials	3
MSE 6402	Crystallography, Structure and Defects	3
MSE 6768	Polymer Structure, Physical Properties, and Characterization	3
Other Required Courses		
MSE 8200	Advanced Presentation Skills [1]	1
MSE 8801	Special Topics (Seminar)	1
Responsible Conduct of Research (Online CITI and in-person PHIL 6000 class)		
Safety Seminar and MSE Safety Exam		

[1] Minimum requirement – can be substituted for an approved technical communication alternative. Alternative advanced technical communication courses include MSE 6754, Engineering Communication. Only 1 hour of the alternative course credit will be allowed to satisfy total MSE hours required.

Other PhD requirements

- Students must pass the three core courses. (If a student gets a 'F' grade in a core course then they must retake that course and get a passing grade)
- Twelve hours from approved MSE curriculum (12 hours), if direct from B.S.
- Six hours from approved MSE curriculum (6.0 hours), if direct from M.S.
- Nine hours in an approved minor (9 hours)
- Pass the qualifying exam
- Complete all course work with a minimum GPA of 3.0
- Write, present and defend a Ph.D. dissertation
- Technical Communications (1.0 hour)
- Teaching assistant duties*

- 31 credit hours are required for Ph.D. if direct from BS
- 25 course credit hours are required for Ph.D. if direct from MS

**Teaching assistant assignments are part of the MSE graduate educational process as it contributes to training graduate students as academics and in research; consequently, all graduate students (GRA) are required to participate in TA activities.*

DOCTOR OF PHILOSOPHY WITH A MAJOR IN MATHEMATICS

PhD Mathematics Website

The doctoral program in Mathematics requires 30 credit hours of graduate-level coursework (6000-level or above) in mathematics and an additional 9 credit hours of coursework towards a minor. Work on a master's thesis (thesis hours) may not be counted toward this requirement, but coursework for the master's degree may be counted. The coursework is subject to breadth requirements guaranteeing exposure to five areas of mathematics (these requirements are discussed more fully on the School of Mathematics website).

Prior to admission to candidacy for the doctoral degree, each student must pass the comprehensive examination, which consists of written exams and an oral examination in the student's proposed area of specialization. Doctoral students must also satisfy the Institute's requirements with respect to the dissertation and final oral examination.

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

DOCTOR OF PHILOSOPHY WITH A MAJOR IN MECHANICAL ENGINEERING

The doctoral program is designed with great latitude to capitalize on variations in experience and interests of individual students. The PhD degree recognizes proficiency and high achievement in research. Candidates for the Doctor of Philosophy degree must earn a graduate grade-point average of at least 3.3.

ME: Graduate Website

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

OVERVIEW

The doctoral program is designed with great latitude to capitalize on variations in experiences and interests of individual students. The PhD degree recognizes proficiency and high achievements in research. The degree requires 42 semester hours of course work beyond the BS degree. Candidates are required to pass the PhD. Qualifying Exam, propose and defend a thesis. Candidates for the Doctor of Philosophy degree must earn and maintain a graduate grade-point average of at least 3.3.

REQUIREMENTS

Program of Study

A Ph.D. Program of Study form must be submitted for approval by your faculty advisor and the Woodruff School Graduate Committee before the end of your first semester of doctoral study.

Upon preliminary approval, the Ph.D. Program of Study will be forwarded to the Woodruff School Graduate Committee for final approval. In preparing your program of study, students should be aware that graduate courses are usually offered only once a year and, in some cases, even less frequently.

Any deviation from your proposed program of study should be approved in advance of taking the new course work by submitting a revised program of study. These revisions may be submitted at any time, except the semester in which you are graduating. Revisions during the semester in which you are graduating must be made on or before the first day of classes. This will allow time for the review and approval process prior to the close of registration for classes.

The Doctor of Philosophy (Ph.D.) degree recognizes proficiency and high achievement in research. The items below are mandatory for all Ph.D. students.

The doctoral degree in Mechanical Engineering requires 42 semester hours of coursework (on a letter-grade basis) beyond the bachelor's degree or its equivalent. Course grades must be C or higher to satisfy PhD degree requirements.

Code	Title	Credit Hours
Major Area [1]		24
Minor Area [2,4]		12
Electives/Other [3,4]		6

1. Must be in a coherent subject area appropriate to ME, or related combinations. If you completed a master's thesis in this area, it may count for nine semester hours toward this requirement (a copy of the M.S. thesis abstract must be attached to the Ph.D. program of study form).ME 6753, ME 6789, and ME 6799 do not meet this requirement.
2. Must be distinctly different from the major area. The minor is intended to provide depth in an area not directly needed for Ph.D. research or related to the area of the principal expertise of the student.
3. May be different than the major or minor, or could be applied to either the major or minor area.
4. CETL classes taken will only satisfy the Minor and Elective Areas.

Qualifying Exam

The objective of the Ph.D. Qualifying Examination is to assess your general knowledge of mechanical engineering or nuclear and radiological engineering.

Grade Point Average Requirement

Must be registered for the semester in which you take the Ph.D. Qualifying Examination and have full graduate standing. A minimum GPA of 3.3 is required to take the qualifying examination.

Examination Schedule

If a student already has a master's degree and matriculate as a Ph.D. student, the student must take the Ph.D. Qualifying Examination within the first year of your initial enrollment date in the Woodruff School graduate program. Those who matriculate with a bachelor's degree must take the qualifying examination within the two year period of your initial enrollment date in the Woodruff School graduate program.

For example, if enrollment were Fall 2019, a student with master's degree and matriculated as a Ph.D. student should have taken the qualifying exams by Spring 2020. If enrollment were Spring 2020, exam would be taken by Fall 2020.

For example, if enrollment were Fall 2019, a student with bachelor's degree and matriculated as a Ph.D. student should have taken the qualifying exams Spring 2021. If enrollment were Spring 2020, exam would be taken by Fall 2021.

Examination Format:

The Exam will consist of one oral exam of the student's subject knowledge, lasting a maximum of one hour, based on three (3) technical publications selected by the exam committee based on the student's research field. The semester before taking the qualifying exam, the student will prepare a one-page summary of his/her research project. The written summary will be used to identify the student's research area and describe the various disciplines and sub-disciplines of relevance to the research.

During the exam, the exam committee members ask the student questions about the papers that can cover the papers' technical contents, the research methods used, and other aspects as indicated in the

evaluation rubric. A standard rubric will be used for evaluating the exam. The rubric will be readily available to students and faculty (e.g., included in the Graduate Handbook). Assessment criteria include proficiency in summarizing, understanding, and evaluating research literature. Each criterion will be evaluated as Proficient, Satisfactory, or Unsatisfactory, with the rubric describing the performance characteristics for each rating. The exam may be retaken one time, within a specified period of time.

RCR Training

Responsible Conduct of Research (RCR) (1 course, 1 hour, pass/fail). Georgia Tech requires that all PhD students complete an RCR requirement that consists of an online component and in-person training. The online component is completed during the student's first semester enrolled at Georgia Tech. The in-person training is satisfied by taking PHIL 6000 or their associated academic program's in-house RCR course.

Seminar Requirement

All Ph.D. students must register for Seminar **8014** (2 credit hours- no letter grade- attend at least 22 seminars).

The course is offered on a pass/fail basis and therefore is **not** included in the 42 semester-hours degree requirement. Attendance at a minimum of 22 seminars per credit hour is necessary to pass, with the attendance record being cumulative from semester to semester. Registration for these credits occurs after you attend the requisite number of seminars.

Teaching Practicum Requirement

All Woodruff School Ph.D. students are required to complete three semester hours of Teaching Practicum (ME 7757/NRE 7757) during the course of their doctoral studies.

Students enrolled in the teaching practicum will work closely with a Woodruff School faculty member in all aspects of teaching a course, including the preparation and delivery of a limited number of lectures (usually in the presence of the course professor) tutorials, evaluation of homework, laboratories, and examinations. The faculty member of record will maintain full responsibility for the course. In addition to the mentored teaching component, students enrolled in the practicum must attend weekly lecture discussions focused on engineering pedagogy, ethics, professional development and leadership. **You must do the teaching component and the classwork in the same term.**

Students may **not** register for this course during the semester in which you expect to receive the Ph.D. ME 7757/NRE 7757 is offered on a pass/fail basis and **cannot** be used to satisfy the 42 semester-hours course work requirement. Students are not allowed to perform GTA responsibilities in the course for which they are participating in the Teaching Practicum.

Proposal Presentation

The objective of the Ph.D. Proposal is to allow an early assessment of your chosen topic of research for the satisfactory completion of the doctoral degree. The proposal should delineate your specific area of research by stating the purpose, scope, methodology, overall organization, and limitations of the proposed study area. The proposal should include a review of the relevant literature and indicate the expected contribution of the research. An oral presentation of the proposal must be undertaken open to public.

Dissertation Presentation

The defense must be at least six (6) months after your proposal presentation.

After adequate preparation, you must complete an original and authoritative investigation in your chosen field that culminates in a written dissertation describing that investigation. An oral defense of the dissertation must be undertaken open to public.

Georgia tech/seoul national university joint degree

The Georgia Tech/Seoul National University Joint doctoral degree in Mechanical Engineering was established for the purpose of a research and teaching partnership with one of the finest universities in the world —number one in Korea. This program provide global opportunities for our students and provide potential for faculty and student exchanges between two campuses.

Program Requirements:

1. The PhD student in the joint program is co-supervised by both co-advisors during his/her stays at both GT and SNU. It should be true collaboration in the spirit of a joint degree program and should be reflected in jointly authored papers, joint conference presentations, etc.

2. Program of study has to be filled and approved during the first semester in the program. It should satisfy the coursework requirements of the home institution. The only additional requirement - a student is required to take at least one graduate level course while in residence at the host institution, which would result in the minimal exposure to the curriculum of each of the host institutions, both in terms of content and delivery style. This course could be counted towards the total credit hour requirement for the PhD degree.

3. The qualifying exams will have to be taken only at the home (originating) institution based on its "local" rules and requirements (the other partner institution will honor the results).

4. Prior to proposal presentation, the GT ME Graduate Committee will have to approve the thesis reading committee, which should be chaired by 2 co-advisors from SNU and GT and must consist of no fewer than 5 members with at least 2 members from each institution.

5. The proposal announcement rules of GT/SNU must be followed and the proposal presentation/defense is strongly preferred to be conducted jointly by the full reading committee (i.e., at the same time, via a video link or by committee members traveling to the same location – either GT or SNU). Under the special circumstances, two separate presentations at each institution can be conducted with the faculty feedback formally exchanged among the reading committee members between the presentation events. This should be coordinated by the co-advisors and approved by the Associate Chair for Graduate Studies, and only a single pass/fail decision must be reached independent of whether one joint or two separate presentations are conducted.

6. There is a GT ME requirement of at least 6 months passing between the proposal presentation and the thesis defense data. It must be adhered regardless of the rules at SNU and whether a student comes to the joint program from GT or SNU.

7. The PhD thesis defense must be conducted jointly, be announced 2 weeks in advance and be open to public, with an entire reading committee present either in person (preferred) or via a video link.

8. The GT ME has two additional requirements of seminars and the teaching practicum. For students entering the joint program from GT as a home institution, these requirements must be met before graduation. For students “originating” from SNU, the teaching practicum requirement could be waived by the GT ME Graduate Committee under certain circumstances due to logistic challenges (it must be petitioned by the student with justification). The seminar requirement must be satisfied via seminars or equivalent events attended either at GT or SNU. The record of attendance must be kept and supplied to GT ME Graduate Office upon completion. 9. The standard GT ME forms need to be used in submitting all requirement documentations that accompany steps 1-8.

DOCTOR OF PHILOSOPHY WITH A MAJOR IN MUSIC TECHNOLOGY

The PhD in Music Technology is a full-time residential program. Students accepted into the PhD program in Music Technology are expected to hold a Masters degree in Music Technology or from an allied field, such as computing, music, engineering, or media arts and sciences. All applicants must demonstrate mastery of core masters-level material covered in Music Technology. This includes proficiency in: Music theory, performance, composition, and/or analysis; Music Information Retrieval, Digital Signal Processing and Synthesis; Interactive Music Systems Design; and Music Cognition.

Proficiency will be assessed through review of a portfolio of the applicant's work and an interview process. Students may waive the requirement to enroll in specific courses by appealing to the Music Technology Graduate Program Committee. Such appeals will typically be granted only if the student has already taken the same course at Georgia Tech or has taken a substantially equivalent course at another institution, and if the student has earned an exceptional grade in that course.

The Graduate Record Examination (GRE) is required for all applicants. A minimum TOEFL score of 600 (paper-based), 250 (computer-based), or 100 (Internet-based) is required for all non-native English speaking applicants.

School of Music

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

Program of Study

Requirements of the Ph.D. with a major in Music Technology will include completion of core courses, a minor, elective coursework, a qualifying paper, comprehensive exams and a dissertation.

Code	Title	Credit Hours
Required Music Technology Core Courses		
MUSI 6001	Music Perception and Cognition	3
MUSI 6003	Music Technology History and Repertoire	3
MUSI 6202	Digital Signal Processing for Music Analysis and Synthesis	3
MUSI 8001	Research Methods	3
MUSI 8002	Apprentice Teaching [3]	6
Required Music Technology Research Courses		
MUSI 7100	Music Technology Research Laboratory	12
Required Music Technology Creative Course		3
MUSI 6002	Computer Supported Interactive Music	
MUSI 6004	Technology Ensemble	
MUSI 6203	Project Studio in Music Technology	
Minor Field of Study [1]		9
Additional Music Technology Electives		6
MUSI 6005	Music Ensemble for Graduate Students	
MUSI 6103	Music Recording and Mixing	
MUSI 6104	Integrating Music into Multimedia	
MUSI 6105	Digital Media Production and Mastering	
MUSI 6106	Audio Software Engineering	
MUSI 6201	Audio Content Analysis	
MUSI 6301	Music Interface Design	
MUSI 6302	The Musical Mind	
MUSI 6303	Network Music	
MUSI 6304	Computer Music Composition	
Additional Elective Courses (subject to advisor approval) [2]		18
Total Credit Hours		**66**

1. Minors, which are selected by students in consultation with their advisor, are designed to enable the student to apply knowledge from other fields toward work in Music Technology. The student is responsible for the full range of knowledge, at the level of professional competence, for the Minor field selected. Minors often focus on traditional fields of study associated with other professions, such as human-computer interaction, digital signal processing, and digital media. Minors typically constitute 9 hours of coursework.
2. Students must take an additional 18 credits of electives. These elective courses may include additional MUSI courses and/or courses in other academic units that are approved by the student's advisor.
3. MUSI 8002 is a 3-credit course which must be taken twice

DOCTOR OF PHILOSOPHY WITH A MAJOR IN NUCLEAR ENGINEERING

The Nuclear and Radiological Engineering and Medical Physics Program within the Woodruff School offers a Doctor of Philosophy degree. There is both a Nuclear Engineering option and a Medical Physics option for this degree. Students may also complete the Nuclear Enterprise Management specialization. The field of nuclear engineering focuses on topics related to radiation interactions with matter. Applications range from nuclear reactor design to fusion power to nuclear medicine.

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

The doctoral degree in Nuclear Engineering (NE) requires 42 semester hours of course work (on a letter-grade basis) beyond the bachelor's degree or its equivalent. The doctoral degree in NE also allows for a specialization in Nuclear Enterprise Management. Course grades must be C or higher to satisfy PhD degree requirements. Candidates for the Doctor of Philosophy degree must earn and maintain a graduate grade-point average of at least 3.3.

Requirements

Program of Study

A Ph.D. Program of Study form must be submitted for approval by your faculty advisor and the Woodruff School Graduate Committee before the end of your first semester of doctoral study.

Upon preliminary approval, the Ph.D. Program of Study will be forwarded to the Woodruff School Graduate Committee for final approval. In preparing your program of study, students should be aware that graduate courses are usually offered only once a year and, in some cases, even less frequently.

Code	Title	Credit Hours
Major Area [1]		24
Minor Area [2]		9
Electives [3]		9
Total Credit Hours		42

1. Must be in a coherent subject area appropriate to NE/RE. If completed a master's thesis in this area, it may count for nine semester hours toward this requirement.
2. Must be distinctly different from the major area. The minor is intended to provide depth in an area not directly needed for Ph.D. research or related to the principal area of expertise.
3. No restrictions.

Nuclear Engineering/Medical Physics

The doctoral degree requires 52 semester hours of course work (on a letter-grade basis) beyond the bachelor's degree or its equivalent. A total of 46 semester hours must be at the 6000 level or above. Up to six semester hours may be at the 4000 level. Any courses required for the B.S.M.E. or the B.S.N.R.E **do not** meet these respective course requirements.

Code	Title	Credit Hours
Major Area [1]		34
Minor Area [2]		9
Electives/Other [3]		9
Total Credit Hours		52

1. Must be in a coherent subject area appropriate to NE/RE. If you completed a master's thesis in this area, it may count for nine semester hours toward this requirement.
2. Must be distinctly different from the major area. The minor is intended to provide depth in an area not directly needed for Ph.D. research or related to the principal area of expertise.
3. May be different than the major or minor, or could be applied to the major or minor area.

Qualifying Exam

Grade Point Average Requirement

Must be registered for the semester in which you take the Ph.D. Qualifying Examination and have full graduate standing. A minimum GPA of 3.3 is required to take the qualifying examination.

Examination Schedule

If a student already has a master's degree and matriculate as a Ph.D. student, the student must take the Ph.D. Qualifying Examination within the first year of your initial enrollment date in the Woodruff School graduate program. Those who matriculate with a bachelor's degree must take the qualifying examination within the two-year period of your initial enrollment date in the Woodruff School graduate program.

For example, if enrollment were Fall 2019, a student with master's degree and matriculated as a Ph.D. student should have taken the qualifying exams by Spring 2020. If enrollment were Spring 2020, exam would be taken by Fall 2020.

For example, if enrollment were Fall 2019, a student with bachelor's degree and matriculated as a Ph.D. student should have taken the qualifying exams Spring 2021. If enrollment were Spring 2020, exam would be taken by Fall 2021.

Examination Format:

The grading of the examinations will conform to existing Woodruff School guidelines. The results of the three examinations (two written examinations and the oral examination) will be reviewed by the NRE/MP faculty and reported to the Woodruff School Office of Student Services and the Woodruff School academic faculty.

Students will be notified of the results of the exam (pass/fail in each area as well as an overall pass/fail grade) by letter from the Associate Chair for Graduate Studies. The Associate Chair will counsel each student who does not pass the exam. Students not passing the exam are encouraged to discuss their performance with their faculty advisors as well as the chairs of the appropriate area exam committees.

RCR Training

Responsible Conduct of Research (RCR) (1 course, 1 hour, pass/fail). Georgia Tech requires that all PhD students complete an RCR requirement that consists of an online component and in-person training. The online component is completed during the student's first semester

enrolled at Georgia Tech. The in-person training is satisfied by taking PHIL 6000 or their associated academic program's in-house RCR course.

Seminar Requirement
All Ph.D. students must register for Seminar **8014** (2 credit hours- no letter grade- attend at least 22 seminars).

The course is offered on a pass/fail basis and therefore is **not** included in the 42 semester-hours degree requirement. Attendance at a minimum of 22 seminars per credit hour is necessary to pass, with the attendance record being cumulative from semester to semester. Registration for these credits occurs after you attend the requisite number of seminars.

Teaching Practicum Requirement
All Woodruff School Ph.D. students are required to complete three semester hours of Teaching Practicum (ME/NRE 7757) during the course of their doctoral studies.

Students enrolled in the teaching practicum will work closely with a Woodruff School faculty member in all aspects of teaching a course, including the preparation and delivery of a limited number of lectures (usually in the presence of the course professor) tutorials, evaluation of homework, laboratories, and examinations. The faculty member of record will maintain full responsibility for the course. You must do the teaching component and the classwork in the same term.

In addition to the mentored teaching component, students enrolled in the practicum must attend weekly lecture discussions focused on engineering pedagogy, ethics, professional development and leadership. Students may **not** register for this course during the semester in which you expect to receive the Ph.D. ME/NRE 7757 is offered on a pass/fail basis and **cannot** be used to satisfy the 42 semester-hours course work requirement. Students are not allowed to perform GTA responsibilities in the course for which they are participating in the Teaching Practicum.

Proposal Presentation
The objective of the Ph.D. Proposal is to allow an early assessment of your chosen topic of research for the satisfactory completion of the doctoral degree. The proposal should delineate your specific area of research by stating the purpose, scope, methodology, overall organization, and limitations of the proposed study area. The proposal should include a review of the relevant literature and indicate the expected contribution of the research. An oral presentation of the proposal must be undertaken open to public.

Dissertation Presentation

The defense must be at least six (6) months after your proposal presentation.

After adequate preparation, you must complete an original and authoritative investigation in your chosen field that culminates in a written dissertation describing that investigation. An oral defense of the dissertation must be undertaken open to public.

Doctor of Philosophy with a Major in Nuclear Engineering - Medical Physics Option

The graduate program in nuclear engineering/medical physics leads to the degrees of

- Master of Science in Nuclear Engineering,
- Master of Science in Medical Physics,
- Master of Science, and
- Doctor of Philosophy.

The medical physics option in the doctoral program is designed for students with a specific interest in the fields of medical physics and leads to a Doctor of Philosophy with a major in Nuclear Engineering. Candidates for the Doctor of Philosophy degree must earn a graduate grade-point average of at least 3.3.

DOCTOR OF PHILOSOPHY WITH A MAJOR IN OCEAN SCIENCE AND ENGINEERING

The mission of the graduate program in Ocean Science and Engineering (OSE) is to educate the next generation of transdisciplinary ocean scientists and engineers by combining the basic and applied sciences with innovative ocean technologies, and to advance interdisciplinary research at the frontiers of the physical, biological, chemical and human dimensions of ocean systems.

Georgia Tech's transdisciplinary PhD OSE program is designed to train and prepare PhD level scientists to identify and solve foundational and applied problems in the ocean sciences and engineering. Training such students involves ensuring that students are well versed in a diverse set of quantitative toolkits in addition to having developed expert-level knowledge and experience in applying quantitative methods. Hence, the program training defines core topics across the three Schools and the essential knowledge required by the students. The expectations exceed that of traditional PhDs in science or engineering as OSE requires an additional layer of integration between the science and engineering and involves research immersion. The program delivery is organized around four priorities:

Priority 1. Develop an OSE student & faculty community at GT.

Priority 2. Prepare students to perform high-quality research in OSE.

Priority 3. Support students as they become independent OSE experts.

Priority 4. Align students' research with job opportunities in academia, government and industry.

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

The PhD degree in OSE requires a minimum of 32 semester hours of coursework to cover the core topics articulated in the essential knowledge list (EKL). Students will be considered "in good academic standing" if they are making satisfactory progress toward completion of the degree, and have met a cumulative grade point average (GPA) equal or grater to 3.2 for the number of credits that they have attempted.

Students enrolled in the OSE program are expected to be trained and knowledgeable in at least three core topics of ocean science and engineering (one in each School). This training is available through courses provided in the different schools participating in the program. The core topics are:

CEE:

- **Coastal & Ocean Mechanics**
- **Environmental Biotechnology**

BIO:

- **Marine Ecology & Conservation**
- **Biological & Microbial Oceanography**

EAS:

- **Physical and Chemical Oceanography**
- **Ocean & Climate**

For each of the three selected topics the students will choose one or two courses for a total of 4 **core courses** around which they will build their Essential Knowledge List (EKL). The EKL will provide the foundation for the Comprehensive Exam to be taken by all students by the end of the second year. Depending on the student background, the program of study may require taking additional courses to fulfill the core topic requirement, or may partially lessen the course load if the student can demonstrate to have acquired the necessary foundation in one of the topics (this applies for example to students with a Master degree relevant to any of the Research Themes). An EKL containing the selection of core topics and associated courses must be completed and approved by the **OSE Graduate Studies Committee (GSC)** by the end of the first semester.

The OSE PhD program requires completion of four 3-hour credit courses between the ones listed below. Student must choose at least one core topic and one class from each school. First year students must also attend the OSE Seminar (2 credit hours).

Code	Title	Credit Hours
OSE Core Courses		**14**
EAS 8802	Special Topics (OSE Seminar)	
Four courses spanning at least 3 courses, at least one from each School:		
CEE Core Topics:		
Coastal and Ocean Mechanics:		
CEE 6261	Environmental Fluid Mechanics	
CS 8803	Special Topics (Coastal Mechanics)	
Biology Core Topics:		
Marine Ecology and Conservation:		
BIOL 6417	Marine Ecology	
BIOL 6221	Biological Oceanography	
Biological and Microbial Oceanography:		
BIOL 6410	Microbial Ecology	
BIOL 6221	Biological Oceanography	
Earth and Atmospheric Sciences Core Topics:		
Physical and Chemical Oceanography		
EAS 6305	Physical and Chemical Oceanography	
EAS 6122	Biogeochemical Cycles	
EAS 6490	Advanced Environmental Data Analysis	
Ocean and Climate:		
EAS 6140	Thermodynamics of Atmospheres and Oceans	
EAS 8803	Special Topics (Climate and Global Change)	
Ethics/RCR Training Requirement		
OSE Specialization:		**9**
Elective courses that increase depth of understanding in the research theme chosed by PhD candidate		
Minor:		**9**
Courses outside the students' selected themes		
Total Credit Hours		**32**

DOCTOR OF PHILOSOPHY WITH A MAJOR IN OPERATIONS RESEARCH

The Doctor of Philosophy in Operations Research has the following principal objectives:

1.) To train students who are able to advance the state of knowledge and practice in operations research through innovative research contributions.

2.) To train students who are able to integrate and apply principles from optimization, stochastic processes, simulations, and machine learning to innovate, and create operations research models and apply them to solve important real-world problems.

3.) To train students who are able to participate in multidisciplinary teams that include individuals whose primary background is in statistics, optimization, engineering, mathematics and science.

4.) To provide a high quality education that prepares individuals for careers in industry, government (e.g., national laboratories), and academia, both in terms of knowledge, computational (e.g., software development) skills, and mathematical modeling skills.

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

Students in the Ph.D. in Operations Research program choose a single track from Optimization, Stochastics, or Applications that guides the program of study as given below.

Code	Title	Credit Hours
Domain Core (6 courses)		
ISYE 6661	Linear Optimization	3
ISYE 6662	Discrete Optimization	3
ISYE 6663	Nonlinear Optimization	3
ISYE 6761	Stochastic Processes I	3
ISYE 6762	Stochastic Processes II	3
ISYE 6832	Simulation Theory and Methods	3
Depth Electives (3 or more courses)		
Students choose courses below only in their chosen track:		
Optimization		
ISYE 6664	Stochastic Optimization	3
ISYE 6679	Computational Methods in Optimization	3
ISYE 7510	Graph Algorithms	3
ISYE 7661	Theory of Linear Inequalities	3
ISYE 7682	Convexity	3
ISYE 7683	Advanced Nonlinear Programming	3
ISYE 7686	Advanced Combinatorial Optimization	3
ISYE 7687	Advanced Integer Programming	3
ISYE 7688	Computational Mathematical Programming	3
Stochastics		
ISYE 6664	Stochastic Optimization	3
MATH 6241	Probability I	3
MATH 6242	Probability II	3
MATH 7244	Stochastic Processes and Stochastic Calculus I	3
Applications		
ISYE 6229	Productivity Measurement and Analysis	3
ISYE 6230	Economic Decision Analysis	3
ISYE 6664	Stochastic Optimization	3
ISYE 6759	Stochastic Processes in Finance	3
ISYE 7201	Production and Service Systems Engineering	3
ISYE 7203	Logistics Systems Engineering	3
MATH 7244	Stochastic Processes and Stochastic Calculus I	3
Breadth Electives (2 or more courses)		
Students choose courses below only in their chose track		
Optimization		
ISYE 6230	Economic Decision Analysis	3
ISYE 6412	Theoretical Statistics	3
ISYE 6656	Queuing Theory	3
ISYE 7201	Production and Service Systems Engineering	3
ISYE 7203	Logistics Systems Engineering	3
ISYE 7400	Advanced Design of Experiments	3
ISYE 7401	Advanced Statistical Modeling	3
ISYE 7405	Multivariate Data Analysis	3
MATH 6014	Graph Theory and Combinatorial Structures	3
MATH 6241	Probability I	3
MATH 6242	Probability II	3
MATH 6643	Numerical Linear Algebra	3
MATH 6644	Iterative Methods for Systems of Equations	3
CS 6550	Design and Analysis of Algorithms	3
CS 7520	Approximation Algorithms	3
CS 7530	Randomized Algorithms	3
Stochastics		
BIOL 7023	Bioinformatics	3
ISYE 6412	Theoretical Statistics	3
ISYE 6645	Monte Carlo Methods	3
ISYE 6679	Computational Methods in Optimization	3
ISYE 6759	Stochastic Processes in Finance	3
ISYE 7201	Production and Service Systems Engineering	3
ISYE 7203	Logistics Systems Engineering	3
ISYE 6400	Design Of Experiments I	3
ISYE 7401	Advanced Statistical Modeling	3
ISYE 7405	Multivariate Data Analysis	3
Applications		
ISYE 6402	Time Series Analysis	3
ISYE 6673	Financial Optimization Models	3
ISYE 6679	Computational Methods in Optimization	3
MATH 6014	Graph Theory and Combinatorial Structures	3
MATH 6241	Probability I	3
MATH 6242	Probability II	3
ISYE 6656	Queuing Theory	3
ISYE 7400	Advanced Design of Experiments	3
ISYE 7401	Advanced Statistical Modeling	3

ISYE 7405	Multivariate Data Analysis	3
ISYE 7682	Convexity	3
ISYE 7683	Advanced Nonlinear Programming	3
ISYE 7686	Advanced Combinatorial Optimization	3
ISYE 7687	Advanced Integer Programming	3
CS 6550	Design and Analysis of Algorithms	3
CS 7520	Approximation Algorithms	3
CS 7530	Randomized Algorithms	3

Comprehensive exam
The comprehensive examination for the Ph.D. in Operations Research is based on content of the courses in the Domain Core. Students must complete exams in ISYE 6661 and 6761, and one other Domain Core course.

Second year paper requirement
Students in the Ph.D. in Operations Research program are required to submit a second year paper no later than the end of Spring semester of their second full program year. This paper at a minimum:

- defines a research problem;
- provides a literature review;
- describes progress towards solving the research problem;
- identifies additional research questions to be answered and steps to be taken.

The advisor needs to certify that the document meets the above requirements, that it was written primarily by the student, and that the student is making good progress on research and should stay in the OR program. Should a student fail to complete the paper on time, they will be asked to leave the program.

Dissertation Research Proposal
The first step toward completing a final dissertation is to receive formal approval of a dissertation research topic. This is accomplished via the Dissertation Research Proposal. Students must present their dissertation research proposal to the Thesis Advisory Committee no later than the end of Spring semester of the student's third full year in the program.

Each Ph.D. student must prepare a cogent, self-contained written research proposal that should describe the research to be addressed, demonstrate an understanding of existing work, describe intended research approaches, and present initial and anticipated results. The student must deliver this proposal, along with an oral presentation, to his/her committee. The content expected in the written research proposal should be discussed with the research advisor and committee members.

If judged to be satisfactory, the Thesis Advisory Committee members must sign the appropriate section of the Request for Admission to Ph.D. Candidacy form approving the thesis topic. Each member of the committee must also complete the Dissertation Proposal

Assessment Form, available on the ISyE website. The student should bring copies of all forms to the proposal presentation and is responsible for returning all forms to the Academic Programs Office. A student must present the thesis proposal at least one semester prior to the Final Doctoral Examination.

A student who fails to obtain approval of his/her thesis proposal must modify the existing proposal, and if required by the Thesis Advisory Committee, must defend the modified proposal in a subsequent oral presentation. If this second thesis proposal is not successful, the student will have not more than 6 months to identify a new research topic and if necessary a new research advisor, and to report this information to the Associate Chair for Graduate Studies. Failing to do so will prevent a student from continuing in the program.

Dissertation
The primary requirement of a Ph.D. program is the completion of a dissertation, a written work documenting the research findings of a searching and authoritative investigation of a topic in the chosen primary field of study. The dissertation must either extend the boundaries of fundamental knowledge in a field or provide a new and better understanding or interpretation of facts already known. It should demonstrate that the candidate possesses powers of original thought, a talent for scholarship and research, and an ability to organize and present his/her findings.

Georgia Tech Graduate Studies maintains a website that discusses policies and requirements for Ph.D. dissertations at Georgia Tech.

Minor
The minor will follow the standard Georgia Tech requirement: 6 hours outside the student's home unit with a letter grade of 'C' or higher. The courses for the minor should form a cohesive program of study that is approved by the ACGS. Courses selected from the breadth requirements can be used to count toward the Minor.

DOCTOR OF PHILOSOPHY WITH A MAJOR IN PHYSICS

Physics: Graduate Information

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

The PhD degree in physics requires:

1. Successful completion of a set of core physics courses;
2. Successfully passing a Comprehensive Exam (consisting of a written Thesis Proposal and an oral Proposal Exam);
3. Successful completion of a minimum of 2 lecture type physics graduate courses (numbered 6000-level or higher; not including the core courses);
4. Successful completion of set of courses in a `minor' subject;
5. a written PhD thesis

Students are admitted to candidacy when they have completed the first two steps above.

The core physics courses required by the School are as follows:

Code	Title	Credit Hours
Core Physics Courses		
PHYS 6103	Electromagnetism I	3
PHYS 6105	Quantum Mechanics I	3
PHYS 6107	Statistical Mechanics I	3
PHYS 6106	Quantum Mechanics II	3
Total Credit Hours		**12**

In some cases, courses taken to complete the Physics elective requirement (#3 above) may be used to satisfy the Institute requirement that every doctoral student earn 6 credit hours in a minor course of study in a scientific subfield different from the subfield of their PhD thesis research. Alternatively, these credit hours are earned in a school other than physics. Finally, each student must prepare a written dissertation that summarizes the PhD research and present a public, oral defense of the dissertation to a Thesis Exam Committee.

DOCTOR OF PHILOSOPHY WITH A MAJOR IN PSYCHOLOGY

Doctor of Philosophy with a major in Psychology

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

OVERVIEW

The Doctoral program provides the student with specialized coursework and opportunities for research in Cognition and Brain Science, Cognitive Aging Psychology, Engineering Psychology Industrial/Organizational Psychology, or Quantitative Psychology. Each curriculum includes individualized study and research with a strong foundation in general experimental psychology as a basis for this specialization. The goal of the School of Psychology, reflected in the structure of the program described within this handbook, is to provide an academic environment in which the Ph.D. degree will be completed in a reasonable amount of time.

REQUIRED COURSEWORK FOR THE DOCTORAL DEGREE PROGRAMS

Doctor of Philosophy with a Major in Psychology (Specialization in Cognition and Brain Science)

The Cognitive and Brain Science specialty area for the Psychology Ph.D. program trains students to understand diverse aspects of cognition. Students learn about theories of cognitive phenomena and the neurobiological bases of cognition and behavior. Students study the major methods used to measure various components of cognition. These components include attention, sensation and perception, working memory, episodic memory, cognitive control, language, metacognition, spatial cognition, and problem-solving. Faculty research interests include these areas of cognition as they exist in humans and aspects of comparative psychology (animal behavior and cognition). Some faculty members' research interests include human cognitive neuroscience, measuring brain activity during cognition with electrophysiological or imaging techniques in persons with or without neurological dysfunction. The program is closely connected to faculty with interests in the Cognitive Aging program, including understanding the effects of aging on cognitive mechanisms and how aging influences neural functioning and cognition.

- PSYC 6018 Principles of Research Design (3 Credit Hrs.)
- PSYC 6000 Responsible Conduct of Research (1 Credit Hrs.)
- PSYC 6019 Statistical Analysis of Psychological Data I (5 Credit Hrs.)
- PSYC 6020 Statistical Analysis of Psychological Data II (5 Credit Hrs.)
- PSYC 6011 Cognitive Psychology (3 Credit Hrs.) or Psyc 6090 Cognitive Neuroscience (3 Credit Hrs).
- Two Elective Graduate-Level (6000 or higher) Courses (6 Credit Hrs.)

Doctor of Philosophy with a Major in Psychology (Specialization in Cognitive Aging)

The Cognitive Aging specialty area in the Psychology PhD program emphasizes training students about cognition in adulthood. Students gain an understanding of the biological, psychological, and social aspects of aging as they relate to cognitive development over the adult life span. Areas of interest of the faculty include age differences and age changes in basic cognitive mechanisms (such as working memory, episodic memory, attention, speed of processing, and language), higher-order cognition (including adult intellectual development), and practical and contextual aspects of cognition (such as knowledge acquisition, skill development, everyday problem solving, metacognition, emotion regulation, and social cognition). The program is closely connected to faculty with interests in human factors and aging (in the Engineering Psychology program), cognitive neuroscience of aging (in the Cognitive and Brain Sciences program), and aging issues in work and careers (in the Industrial/Organizational Psychology program).

- PSYC 6018 Principles of Research Design (3 Credit Hrs.)
- PSYC 6000 Responsible conduct of Research (1 Credit Hrs.)
- PSYC 6019 Statistical Analysis of Psychological Data I (5 Credit Hrs.)
- PSYC 6020 Statistical Analysis of Psychological Data II (5 Credit Hrs.)
- PSYC 6011 Cognitive Psychology (3 Credit Hrs.)
- PSYC 6060 Psychology of Aging (3 Credit Hrs.)
- PSYC 6041 Proseminar in Cognitive Aging (3 Credit Hrs.)
- PSYC 7020 Survey of Cognitive Aging (3 Credit Hrs.)
- PSYC 8020 Seminar in Cognitive Aging (3 Credit Hrs.)
- PSYC 8020 Seminar in Cognitive Aging (3 Credit Hrs.)

Doctor of Philosophy with a Major in Psychology (Specialization in Engineering Psychology)

The Engineering Psychology Ph.D. program focuses on understanding the capabilities and limitations of human performance from the perspective of perception, cognition, and movement control and applying this knowledge to the design of systems and environments that accommodate those capabilities and limitations.

- PSYC 6018 Principles of Research Design (3 Credit Hrs.)
- PSYC 6000 Responsible Conduct of Research (1 Credit Hrs.)
- PSYC 6019 Statistical Analysis of Psychological Data I (5 Credit Hrs.)
- PSYC 6020 Statistical Analysis of Psychological Data II (5 Credit Hrs.)
- PSYC 6011: Cognitive Psychology (3 Credit Hours)
- PSYC 6014: Sensation & Perception (3 Credit Hours)
- PSYC 7101: Engineering Psych I: Methods (3Credit Hours)
- PSYC 7102: Engineering Psych II: Displays, Controls, & Workspace (3 Credit Hours)
- PSYC 8040: Seminar in Engineering Psychology (3 Credit Hours)
- PSYC 8040: Seminar in Engineering Psychology (3 Credit Hours) or Psyc 7104: Psychomotor and Cognitive Skills (3 Credit hours)

Doctor of Philosophy with a Major in Psychology (Specialization in Industrial/Organizational Psychology)

The Industrial/Organizational Psychology (I/O) PhD program concentrates on research related to the psychology of work and the workplace. Students develop specialized I/O knowledge, skills, and experiences through an individually tailored program of seminars, elective courses, participation in laboratory- and field-based research projects, and training in local organizations.

Quantitative Core (Must Take All)

- PSYC 6018 Principles of Research Design (3 Credit Hrs.)
- PSYC 6000 Responsible Conduct of Research (1 Credit Hrs.)
- PSYC 6019 Statistical Analysis of Psychological Data I (5 Credit Hrs.)
- PSYC 6020 Statistical Analysis of Psychological Data II (5 Credit Hrs.)

I-O Fundamental Requirements (Must Take Three)

- PSYC 7201 Research in I-O Psychology (3 Credit Hrs.)
- PSYC 7202 Personnel Selection (3 Credit Hrs.)
- PSYC 7203 Organizational Psychology (3 Credit Hrs.)

I-O Electives (Must take 4)

- PSYC 6270 Psychological Testing (3 Credit Hrs.)
- PSYC 7204 Training and Development (3 Credit Hrs.)
- PSYC 7205 Teams (3 Credit Hrs.)
- PSYC 7206 Motivation and Job Attitudes (3 Credit Hrs.)
- Psyc 720X Other I-O Named Courses (3 Credit Hrs.)
- Psyc 8050 Seminar in I-O (3 Credit Hrs.)

Foundational Psychology Courses (Must take 2 – Suggested 3)

- PSYC 6011 Cognitive Psychology (3 Credit Hrs.)
- PSYC 6012 Social Psychology (3 Credit Hrs.)
- PSYC 6013 Sensation and Perception (3 Credit Hrs.)
- PSYC 6014 Sensation & Perceptions (3 Credit Hrs.)
- PSYC 6015 Developmental Psychology (3 Credit Hrs.)
- PSYC 6016 Human Abilities (3 Credit Hrs.)
- PSYC 6021 Personality Theories (3 Credit Hrs.)
- PSYC 6060 Psychology of Aging (3 Credit Hrs.)
- PSYC 6090 Cognitive Neuroscience (3 Credit Hrs.)
- PSYC 7020 Survey of Cognitive Aging (3 Credit Hrs.)
- PSYC 7101 Engineering Psychology I: Methods (3 Credit Hrs.)
- PSYC 8000 History & Systems (3 Credit Hrs.)
- PSYC 8020 Seminar in Cognitive Aging (3 Credit Hrs.)

Quantitative Psychology Courses (Must take 2 – Suggested 3)

- PSYC 7301 Multivarite Statistics (3 Credit Hrs.)
- PSYC 7302 Structural Equation Modeling (3 Credit Hrs.)
- PSYC 7303 Psychometric Theory (3 Credit Hrs.)
- PSYC 8060 Seminar in Quantitative Psychology (3 Credit Hrs.)

Doctor of Philosophy with a Major in Psychology (Quantitative Psychology)

The Quantitative Psychology Program emphasizes the interface between quantitative methods and psychological issues. Graduates will be trained as quantitative specialists, with a substantial background in psychology. The exact focus of the student's studies depends on the current interests of the faculty and the student. Current faculty interests and course offerings include psychometric methods, item response theory, structural equation modeling, multivariate statistics, factor analysis, and multilevel modeling, as well as many other topics in psychological methods and statistics.

Quantitative Core Courses (Must take all)

- PSYC 6018 Principles of Research Design (3 Credit Hrs.)
- PSYC 6000 Responsible conduct of Research (1 Credit Hrs.)
- PSYC 6019 Statistical Analysis of Psychological Data I (5 Credit Hrs.)
- PSYC 6020 Statistical Analysis of Psychological Data II (5 Credit Hrs.)

Five Quantitative Psychology Elective Courses (Must take 5 courses)

- **PSYC 7303. Psychometric Theory. 3 Credit Hours.**
- PSYC 7301 Multivariate Statistics (3 Credit Hrs.)
- PSYC 7302 Structural Equation Modeling (3 Credit Hrs.)
- PSYC 7303 Psychometric Theory (3 Credit Hrs.)
- PSYC 8060 Seminar in Quantitative Psychology (3 Credit Hrs.), Note 1

Note 1: Typical topics for Psyc 8060 Seminar courses include Multilevel Modeling, Longitudinal Modeling, Categorical Data Analysis, Scaling, Advanced Item Response Theory, Dynamical Systems, and Time Series. The five-course Elective requirement for the Ph.D. with a speciliazation in Quantitative can be fulfilled with all Psych 8060 seminar courses or other (elective) courses approved by the area and graduate coordinator.

ADDITIONAL REQUIREMENTS FOR THE DOCTORAL DEGREE

MASTER THESIS: Students are required to complete a master thesis reporting the results of independent research that indicates research competency. The thesis must be successfully defended to the student's thesis committee. Students should enroll in a minimum of 9 credit hours of PSYC 7000 Master's Thesis while completing their project and thesis.

INSTITUTE MINOR: The minor consists of at least *nine semester hours* of work in related courses, selected by the student in consultation with the Advisor and approved by the Graduate Coordinator and the Georgia Tech Office of Graduate Studies. Courses taken for the minor should be at the 6000 level or above. Under special circumstances, a single (3-credit or less) 4000 level course may be used to fill the requirement (but only if it is a course offered outside of the School of Psychology). Courses that are taken as pass/fail are not eligible to count toward the doctoral minor.

PRELIMINARY EXAM: A qualifying examination committee shall be appointed for each student and is responsible for making an overall recommendation concerning the outcome of the qualifying examination.

DOCTORAL THESIS: Students are required to complete a doctoral thesis reporting the results of independent research that advances the state-of-the-art in psychological science in the student's specialization discipline. The dissertation thesis must be successfully defended to the student's thesis committee. Students should enroll in 1-21 credit hours of PSYC 9000 Doctoral Thesis while completing their project and thesis.

DOCTOR OF PHILOSOPHY WITH A MAJOR IN PUBLIC POLICY

The PhD in Public Policy is a research-oriented program that prepares students for advanced professional work or for academic careers. Georgia Tech houses two PhD programs in Public Policy, including one offered jointly with Georgia State University. The programs stress intellectual and methodological rigor, building upon the theory and applications of political and organizational analysis, research design, quantitative analysis, and economics.

Financial Aid

Most PhD students receive financial assistance, chiefly through sponsored research projects and teaching assistantships.

PhD Information

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

All students must have completed the equivalent of the core courses for the Master of Science in Public Policy before they begin the doctoral core curriculum. The doctoral core curriculum consists of six three-credit-hour courses (seven in the joint program). These courses are designed to provide students with a theoretical and methodological foundation for conducting public policy research.

Code	Title	Credit Hours
Core Courses		
PUBP 8200	Advanced Research Methods I	3
PUBP 8205	Advanced Research Methods II	3
PUBP 8211	Microeconomic Theory and Applications	3
PUBP 8500	Research Seminar in Public Policy	3
PUBP 8510	Logic of Policy Inquiry	3
PUBP 8520	Scope and Theory of Public Policy	3

Doctor of Philosophy in Public Policy (Joint Degree with Georgia State University)

Code	Title	Credit Hours
Core Courses		
PUBP 8200	Advanced Research Methods I	3
PUBP 8205	Advanced Research Methods II	3
PUBP 8211	Microeconomic Theory and Applications	3
PUBP 8500	Research Seminar in Public Policy	3
PUBP 8510	Logic of Policy Inquiry	3
PUBP 8520	Scope and Theory of Public Policy	3
PUBP 8813	Special Topics (Advanced Topics in Analysis and Evaluation)	3

Details on the requirements of the joint program, including equivalent courses at Georgia State University, are available on the website.

This core is supplemented with in-depth study of a substantive area of public policy. The Georgia Tech program focuses on science and technology policy, environmental and energy policy, and urban and regional economic development policy. The joint program includes several additional majors, including health policy, policy and program evaluation, and public finance. Students may pursue concentrations with groups of courses already developed by the faculty or an individualized concentration with the written approval of the student's advisor and the Graduate Committee.

In the Georgia Tech program, the major area of concentration consists of four courses and has a capstone seminar at the PhD level that majors are required to complete. The minor concentration is a three-course area of study, preferably taken outside the School of Public Policy.

Other requirements for the PhD include completion of the one-year residency requirement; admission to candidacy for the degree through successful completion of qualifying exams and a dissertation proposal; and completion and successful defense of a doctoral dissertation (9 credit hours).

In summary, the credits required for the PhD are usually as follows:

Code	Title	Credit Hours
Core		18
Major		12
Minor		9
Qualifiers - Written Exam		3
Colloquium - oral exam: presentation of dissertation proposal		3
Dissertation		9
Total Credit Hours		**54**

Joint Program Requirements

Code	Title	Credit Hours
Core		21
Major		12
Minor		9
Qualifiers - Written Exam		3
Colloquium - oral exam: presentation of dissertation proposal		3
Dissertation		9
Total Credit Hours		**57**

This total assumes that a student already has satisfied the core requirements of the master's degree (at most an additional twenty-five hours).

DOCTOR OF PHILOSOPHY WITH A MAJOR IN QUANTITATIVE BIOSCIENCES

Participating Schools

School of Biological Sciences
School of Chemistry and Biochemistry
School of Earth and Atmospheric Sciences
School of Mathematics
School of Physics
School of Psychology

Objective of the Program

The mission of the Georgia Tech Ph.D. program in Quantitative Biosciences (QBioS) is to enable the discovery of scientific principles underlying the dynamics, structure, and function of living systems. The QBioS program is designed to provide Ph.D. graduates with the skills and expert knowledge necessary to move directly into academia, industry and/or government, where they can apply their specific domain expertise and broadly relevant modeling tools.

The Ph.D. program in Quantitative Biosciences is offered by the College of Sciences. Students select a home school within the College of Sciences and can select a thesis advisor from the entire list of program faculty, irrespective of home school. QBioS Ph.D. students will pursue thesis research across a broad range of research themes spanning molecular and cellular systems, chemical biology, behavior and applied physiology, ecology, evolution and earth systems. The diverse faculty will ensure that students are prepared for quantitative challenges in the biosciences, whether in the analysis of big data, analysis of complex models, and iterative design of theory and experiments.

We welcome applications from high-quality undergraduate students, who are:

1. trained in the physical sciences (e.g., physics, earth systems and chemistry), mathematics, computer science, and engineering, who would like to transition to a career focusing on interface research in the biosciences;
2. trained in the biosciences (e.g., integrative biology, physiology, ecology, evolution, neuroscience, biochemistry, molecular & cellular biology) with particular strengths and interests in quantitative analysis and modeling.

In addition, students with Masters degrees in those thematic areas are strongly encouraged to apply.

For more information visit qbios.gatech.edu

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

The Ph.D. in Quantitative Biosciences is designed to give graduates training in the quantitative analysis of problems in the biosciences – spanning foundational advances and application to challenges in human health, energy and the environment. The requirements include:

- a program of study in core QBioS biosciences and quantitative modeling courses;
- a coherent interface Minor course of study;
- a minimum of two group rotations in the first year;
- an English writing class (if recommended by committee);
- a Thesis Proposal;
- acceptance of at least one scientific publication;
- a written Ph.D. thesis and a public defense of that thesis.

There is no comprehensive qualifying exam and no foreign language requirement. Georgia Tech requires that all doctoral students maintain a 3.0 grade point average. With the permission of the research supervisor and the QBioS Director, Ph.D. students may seek a concurrent MS degree. If so, the courses taken for the MS may be counted to satisfy the Minor requirement. During the semester preceding the semester when the Ph.D. degree is expected, students must submit an Online Application for Graduation to the Registrar. The complete set of requirements involving credit hours are listed below. The majority of coursework should be completed in years 1-2, with thesis research representing the bulk of credit hours in years 3-5.

Code	Title	Credit Hours
Core Courses		
BIOL/PHYS 6750	Foundations of Quantitative Biosciences	4
BIOL 8801	Special Topics (Seminar in Biology - Quantitative Biosciences)	1
BIOL 8801	Special Topics (Seminar in Biology - Quantitative Biosciences)	1
BIOL 8801	Special Topics (Professional Development in Quantitative Biosciences)	1
Quantitative Modeling core [1]		**9**
Bioscience disciplinary electives [2]		**6**
Quantitative Models in the Biosciences		**3**
Scientific interface minor [3]		**9**
Rotations		**6**
Thesis Research		**15**

1 Including a computational-focused class
2 Two courses; including one involving the application of quantitative methods to the biosciences
3 Three courses; equivalent to Institute approved minor, of which 3 hours must be distinct from courses listed above

Detailed Program Requirements

Core courses (4 courses): These four courses taken in the first year are taken by all QBioS Ph.D. students. The Foundations class is organized around the understanding of key advances in the biosciences, one organizing unit at a time, in which the advances depended critically on quantitative methods and reasoning. The overall objective of the course is to teach graduate students how to reason quantitatively in the biosciences given uncertainty in mechanisms, rates and reliability of measurements. The Seminar classes will enable students to meet, learn and discuss rotating topics representing ongoing advances in QBioS with Program Faculty.

Quantitative Modeling Core (3 courses): Students select courses *a la carte* that involve rigorous quantitative methods and models. Any MATH 6xxx, 7xxx or 8xxx course is eligible for this requirement, as are many courses in the Colleges of Science, Computing, and Engineering. Please

contact the QBioS Director for approval of courses not listed on the list of approved courses HERE.

Bioscience Disciplinary Electives (2 courses): Students select courses *a la carte* that deepen their understanding of the biosciences in one of the following areas:

- Chemistry of Biological Systems
- Molecular and Cellular Systems
- Physiology & Behavior
- Ecology
- Evolution
- Earth Systems

Quantitative Models in the Biosciences (1 course): Students select one course *a la carte* that satisfies the requirement that students take a course involving the direct application of quantitative methods to the biosciences. All courses satisfying this requirement are 3 credit hours, including problem sets, involving mathematical and computational methods. Please note that any courses approved to fulfill Quantitative Models in the Biosciences may instead be used to fulfill Quantitative Modeling Core requirements. A list of approved courses may be found HERE.

Graduate Coursework from Other Universities and Programs: Graduate level course work taken for a Master's degree (even at another university) may be included in the Ph.D. Program of Study provided that a grade of B or better was earned for these courses. The submitted program of study and course justification should also include a copy of the student's transcript and a detailed course description and syllabus for each course for which the student wishes to receive credit. The QBioS Graduate Committee typically approves up to two courses (6 credit hours). Students may appeal to count more in extenuating circumstances.

Interface Minor
Students select three courses that will enhance the thesis and enable the development of breadth and flexible thinking in the student. This requirement will also serve, in part, to satisfy the Institute required minor. One of these courses must be in addition to those taken as part of the core course requirements.

Rotations
Special Problems (BIOL/PHYS/home school 8901) is two, 3-hour courses arranged with two QBioS program faculty members in the spring semester of the first year. Registration requires the permission of two professors. The Special Problems should be viewed as a serious opportunity to begin Ph.D. research. Students should also register for a Special Problem in the summer of their first year for 12 credit hours. In most cases this course will have a single professor using the special problem designation appropriate to the School of the advisor and the special problem advisor will represent the eventual thesis advisor of the student. However, students are permitted to arrange for up to 2 additional rotations using Special Problems mechanism in the summer of their first year. Selection of a thesis advisor is expected for all students by the end of their first year in the program.

Academic Writing Requirement
All students must demonstrate competency in academic and technical writing to complete the academic writing requirement. The student's Thesis Proposal Committee (TPC) is responsible for evaluating this requirement, through evaluation of first-authored publications and/or the thesis proposal. In the event that students require additional training, the TPC may recommend that students take and pass a semester-long graduate course in English-language academic writing. For non-native English speakers, the relevant course is CETL 8723. Non-native speakers may also take ESL-OL01L thorough the GT Language Institute. This online course is aimed at international graduate students and helps them develop a fundamental understanding of the basic principles of academic research writing. For native English speakers, the relevant course is CETL 8721. At this time, the Center for Teaching and Learning plans to offer the 8721 course during summer semesters only. For all students, the writing requirement should be discussed as part of the initial TPC meeting and the initial evaluation of the writing requirement should be completed no later than the end of the 2nd year, consistent with the scheduling of the thesis proposal.

Thesis Proposal and Qualifying Exam
Written Thesis Proposal
By the end of the second year at Georgia Tech (no later than September 30 of year 3), every QBioS Ph.D. student must seek admission to candidacy by presenting a 10-page thesis Proposal, including 2 additional pages of references to a Thesis Proposal Committee (TPC). The written Thesis Proposal should contain (1) a review of the literature of their field; (2) a discussion of how the proposed research fits into that field; (3) a summary of preliminary results; (4) a description of the planned work and primary aims of the thesis.

Oral Defense of Proposal
Every student is required to defend their Written Thesis Proposal to their TPC in the form of a

45 minute oral presentation followed by brief questions from the public, followed by an additional 30-60 minutes of questions from the committee. Each TPC member (except for the supervisor) is expected to ask questions designed to probe the students' understanding of their proposed research. It is the responsibility of the TPC to decide if the student "passes" or "fails" the Thesis Proposal – judged comprehensively based on the quality of the written and oral components. A student who passes is formally admitted to Ph.D. candidacy. Criterion for evaluating the quality of the proposal will be distributed by the TPC to the student in advance of the proposal development and submission.

Procedures for Re-examination of the Proposal
A student who fails must rewrite his/her Thesis Proposal and/or repeat the oral presentation as directed by their TPC. The re-examination must occur no later than the semester subsequent to the initial exam. A student who fails his/her examination twice will be removed from the program.

Publication Requirement
Some portion of the Ph.D. candidate's research must have been submitted as a "first-author" publication in a refereed scientific journal or suitable public archive before the thesis defense. Given differences in fields and author order conventions, here we use the term "first-author" to denote the person primarily (or equally) responsible for conducting the research that led to publication. The term first-author applies to "joint" designations of first-authorships. In fields in which last name ordering is used, the "first-author" requirement is satisfied so long as the student was primarily – whether solely or jointly – responsible for conducting the research that led to publication. Note that if your work was supported in part by the QBioS program thorough a program GRA, then you should include an Acknowledgement as such: "This work was supported in part by the Interdisciplinary Graduate Program in Quantitative Biosciences at the Georgia Institute of Technology."
All publications arising during your PhD include two addresses:

1. Interdisciplinary Graduate Program in Quantitative Biosciences;

2. Your home school (School of Biological Sciences, School of Physics, etc.).

The physical address can be the same (i.e., Georgia Institute of Technology, Atlanta, GA 30332).

PhD Thesis Defense

Procedures Prior to the Defense

Institute-Required Forms: To complete its records for each Ph.D. student, the Registrar's Office requires an Online Application for Graduation, which must be submitted to the Registrar's Office prior to the student's final semester. The exact date is listed in the official school calendar by semester.

Enrollment Status: The student must be registered during the semester in which the final presentation occurs. A student must also be registered the semester he/she plans to graduate unless an enrollment waiver is requested and approved. An enrollment waiver will not be approved if the Thesis has not been accepted by the Graduate Studies Office by the published deadline.

Thesis Documents: The Ph.D. thesis presentation consists of (1) a written thesis document and (2) an oral presentation and examination evaluated by the Ph.D. Thesis Reading Committee. The thesis document must be received by the members of the thesis committee at least two full weeks prior to the oral presentation and examination. The student should contact each committee member to arrange the delivery of the written thesis in either hard-copy or electronic format.

Scheduling: The student must poll the committee and establish a date and time for the presentation, reserve a room and prepare an announcement of the presentation. The student is responsible for reserving the room and obtaining the necessary audio-visual equipment prior to the oral presentation. Some faculty have extremely busy schedules, and this step should be done at least 6 weeks in advance to ensure faculty availability.

Procedures During the Defense

The thesis defense includes an oral presentation of the findings of the thesis, questions from the audience and the committee, and a closed Q&A with the student and the thesis reading committee (TRC). After successful public defense of the Thesis, the candidate prepares a final manuscript incorporating the modifications required by the Thesis Committee. After obtaining approval signatures from the Thesis Committee and the Director of QBioS, the candidate should follow the electronic submission, printing and distribution specified online.

Doctoral Advisor and Thesis Committee

Selecting an Advisor

Students will rotate with two different QBioS faculty members in the spring of their first year, with additional opportunities for up to two more rotations in the summer of their first year. QBioS students should identify a thesis advisor no later than the end of the summer of their first year. Upon mutual agreement, the student and advisor will inform the QBioS graduate committee which will then review and confirm all requests

Committee Formation

Students should identify a Thesis Proposal Committee (TPC) composed of their primary research supervisor and three other faculty members. Of these three, at least one must be from the QBioS program faculty. The TPC is responsible for evaluating the proposal and should be constituted in the fall semester of the second year in the program – and hold an initial, advisory meeting with the student. In most cases the TPC members continue to serve as members of the Thesis Reading Committee (TRC) after the student passes their qualifying exam.

Georgia Tech requires that all doctoral students have five members for their final thesis committee (Thesis Reading Committee), three of whom must be academic faculty. Georgia Tech requires that one committee member must be outside the student's home school. QBioS requires that the Thesis Reading Committee includes five faculty members*, composed of your primary research advisor and four other members. Of these four members, at least two must be members of the academic faculty of QBioS program and at least one must be external to the QBioS program.

*GT allows external committee members that are not faculty (e.g., staff scientist or museum curator), so long as they hold a PhD.

Yearly Thesis Review

The student should meet with his/her Thesis Reading Committee on at least a yearly basis to review research progress. Students are required to complete an annual progress update that is due at the start of each subsequent fall semester or upon graduating and will be distributed electronically.

DOCTOR OF PHILOSOPHY WITH A MAJOR IN ROBOTICS

Program website: http://phdrobotics.gatech.edu

Program requirements: http://phdrobotics.gatech.edu/program

Students pursuing a PhD in Robotics must take 36 credit hours of core research and elective courses, pass a comprehensive qualifying exam with written and oral components, and successfully complete, document, and defend a piece of original research culminating in a doctoral thesis. Students select a home school, such as ECE, AE, ME, or IC, and apply for admission to the PhD program in robotics through that home school.

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

Program of Study

The main emphasis of the Ph.D. program is the successful completion of an original and independent research thesis. The degree requirements are designed around this goal.

Minimum Requirements

- Completion of 36 semester hours of courses with a letter grade
- Passing a comprehensive qualifying exam with written and oral components.
- Successfully conducting, documenting, and defending a piece of original research culminating in a doctoral thesis.
- Note: A maximum of two classes (6 semester hours) at the 4000-level may be used to satisfy 36 semester hour requirement.

Code	Title	Credit Hours
CS/AE/ECE/ ME 7785	Introduction to Robotics Research	3
CS/AE/ECE/ ME 8750	Robotics Research Foundation I	3
CS/AE/ECE/ ME 8751	Robotics Research Foundation II	3
Foundation Courses [1]		9
Elective Courses [2]		9
Courses Outside of the Major [3]		9
Total Credit Hours		**36**

Ph.D. Candidacy

Prior to completing all of these requirements, Georgia Tech defines the Ph.D Candidate milestones. Admission to candidacy requires that the student:

1. Complete all course requirements (except the minor);
2. Achieve a satisfactory scholastic record;
3. Pass the comprehensive examination;
4. Submit and receive approval naming the dissertation topic and delineating the research topic.

Core Area Courses

The following courses are in the robotics core areas of Mechanics, Control, Perception, Artificial Intelligence, and Human-Robot Interaction (HRI). They are used to select three foundation courses and three targeted elective courses. Foundation courses are noted with a footnote.

Code	Title	Credit Hours
Mechanics		
AE 6120	Thermal Effects in Structures I [1]	3
AE 6211	Advanced Dynamics II	3
AE 6230	Structural Dynamics	3
AE 6263	Flexible Multi-body Dynamics	3
AE 6270	Applied Nonlinear Dynamics	3
AE 6520	Advanced Flight Dynamics	3
BMED 8813	Special Topics (Robotics) [1]	3
CS 7496	Computer Animation	3
ME 6405	Introduction to Mechatronics	3
ME 6407	Robotics [1]	3
ME 6441	Dynamics of Mechanical Systems	3
ME 6442	Vibration of Mechanical Systems	3
ME 7442	Vibration of Continuous Systems	3
Control		
AE 6252	Smart Structures and Structural Control	3
AE 6504	Modern Methods in Aircraft Flight Control	3
AE 6505	Random Processes and Kalman Filtering	3
AE 6506	Aerospace Guidance and Navigation	3
AE 6511	Optimal Guidance and Control	3
AE 6530	Multivariable Linear Systems and Control [1]	3
AE 6531	Aerospace Robust Control I	3
AE 6532	Aerospace Robust Control II	3
AE 6534	Control of Aerospace Structures	3
AE 6580	Aerospace Nonlinear Control	3
AE 8803	Special Topics (Nonlinear Stochastic Optimal Control)	3
ECE 6550	Linear Systems and Controls [1]	3
ECE 6551	Digital Control	3
ECE 6552	Nonlinear Systems and Control	3
ECE 6553	Optimal Control and Optimization	3
ECE 6554	Adaptive Control	3
ECE 6555	Optimal Estimation	3
ECE 6559	Advanced Linear Systems	3
ECE 6563	Networked Control and Multiagent Systems	3
ME 6401	Linear Control Systems [1]	3
ME 6402	Nonlinear Control Systems	3
ME 6403	Digital Control Systems	3
ME 6404	Advanced Control System Design and Implementation	3
Perception		
CS 6476	Introduction to Computer Vision GR [1]	3
CS 7476	Advanced Computer Vision	3
CS 7616	Pattern Recognition	3
CS 7636	Computational Perception	3
CS 7499	3D Reconstruction and Mapping in Computer Vision, Robotics, and Augmented Reality	3
CS 7626	Introduction to Behavioral Imaging	3

CS 7643	Deep Learning	3
ECE 6255	Digital Processing of Speech Signals	3
ECE 6258	Digital Image Processing	3
ECE 6273	Methods of Pattern Recognition with Application to Voice	3
ECE 6560	Partial Differential Equations in Image Processing and Computer Vision	3
ME 6406	Machine Vision [1]	3
Artificial Intelligence		
CS 3600	Introduction to Artificial Intelligence	3
CS 6601	Artificial Intelligence [1]	3
CS 7612	Artificial Intelligence Planning	3
CS 7640	Learning in Autonomous Agents	3
CS 7643	Deep Learning	3
CS 7648	Interactive Robot Learning	3
CS 8803	Special Topics (Mobile Manipulation)	3
CS 8803	Special Topics (Robot Intelligence)	3
CS 8803	Special Topics (Robot Motion Planning)	3
CS 8803	Special Topics (Computation and the Brain)	3
CS 8803	Special Topics (Statistical Techniques in Robotics)	3
CS/ECE 8803	Special Topics (Probabilistic Graph Models and ML in High Dimensions)	3
ECE 6254	Statistical Machine Learning	3
ECE 6556	Intelligent Control	3
Human-Robot Interaction (HRI) [2]		
AE 6721	Evaluation of Human Integrated Systems [1]	3
CS 7633	Human-Robot Interaction [1]	3
CS 6455	User Interface Design and Evaluation	3
CS 6750	Human-Computer Interaction	3
CS 7648	Interactive Robot Learning [1]	3
CS 8803	Special Topics (Computational Social Robotics)	3
ISYE 6215	Models in Human-Machine Systems	3
ISYE 6224	Topics in Human-Integrated Systems	3
PSYC 6011	Cognitive Psychology	3
PSYC 6014	Sensation and Perception	3
PSYC 6017	Human Abilities	3
PSYC 7101	Engineering Psychology I: Methods	3
PSYC 7104	Psychomotor and Cognitive Skill Learning and Performance	3

1. Foundation course
2. HRI includes two core courses. Students are encouraged, but not required to take both HRI core courses. Students taking both core courses may use their second core class in place of an HRI elective course.

GRADUATE EMBEDDED CERTIFICATE IN ASTROBIOLOGY

The Astrobiology Graduate Certificate Program is part of an initiative linking the schools of Earth and Atmospheric Sciences, Chemistry and Biochemistry, Biological Sciences, Aerospace Engineering, and International Affairs. The purpose of the certificate program is to expand opportunities for students in the interdisciplinary field of 'astrobiology', and to forge innovative links between astrobiology research at Georgia Tech, mission technology, and science communication. The 12-credit certificate program is open to graduate students enrolled in any degree program at the Georgia Institute of Technology. There are no prerequisites for entering the certificate program.

For more information, click here.

Program of Study

Code	Title	Credit Hours
Required courses		
EAS 8001	Seminar (Planetary Science & Astrobiology)	1
EAS/CHEM/BIOL 8802	Special Topics (Seminal Papers in Astrobiology)	2
Cognate course		**3**
AE 6353	Orbital Mechanics	
AE 6355	Planetary Entry, Descent and Landing	
AE 6450	Rocket Propulsion	
AE 6451	Electric Propulsion	
BIOL/EAS 6765	Geomicrobiology	
BIOL 6410	Microbial Ecology	
BIOL 6428	Population Dynamics	
BIOL 6600	Evolution	
BIOL 6607	Molecular Biology of Microbes: Disease, Nature, and Biotechnology	
BIOL 6720	Environmental Microbial Genomics	
CHEM 6572	Macromolecular Structure	
CHEM 6582	Biophysical Chemistry	
EAS 6122	Biogeochemical Cycles	
EAS 6130	Earth System Modeling	
EAS 6200	Environmental Geochemistry	
EAS 6216	Isotope Geochemistry	
EAS 6224	Mineral Surface Geochemistry	
EAS 6370	Physics of Planets	
EAS 6375	Earth and Planetary Materials	
EAS 6380	Land Remote Sensing	
Special Topics		**3**
BIOL 7111	Molecular Evolution	
BIOL 8744	Microbial Symbiosis & Microbiomes	
BIOL 8803	Special Topics (Origin of Complex Life:Cells to Societies)	
CHEM 8803	Special Topics (Chemistry of the Origins & Early Evolution of Life)	
CHEM 8853	Special Topics in Biochemistry (Structure, Function & Origins of Biological Macromolecules)	
CHEM 8833	Special Topics in Organic Chemistry (Intro to Organic Mechanisms)	
CS 7492	Simulation of Biological Systems	
EAS 8803	Special Topics (Ice-Ocean Moons and Planets)	
EAS 8803	Special Topics (Origin of Planetary Systems)	
EAS 8803	Special Topics (Earth System Evolution in a Planetary Context)	
INTA 8001	Seminar in Science, Technology and International Affairs II	
INTA 8803	Special Topics (Space Policy)	
INTA 8803	Special Topics (Space Security)	
PHYS 8813	Special Topics (Radiative Processes)	
Mission Design course		**3**
AE 6372	Aerospace Systems Engineering	
AE 6561	Reliable Control Software for Aerospace and Embedded Applications	
AE 8803	Special Topics (Satellite Orbit Determination)	
AE 8803	Special Topics (Small Satellite Design I/II)	
AE 8803	Special Topics (Spacecraft Altitude Determination and Control)	
AE/EAS 8803	Special Topics (Space Instrumentation for Life Detection)	
CHEM 8813/8823	Special Topics in Inorganic Chemistry (Instrument Design)	
EAS 6360	Space Physics and Space Instrumentation	
EAS 8803	Special Topics (Team X Spacecraft Design)	
EAS 8803	Special Topics (Planetary Spacecraft Design)	
Total Credit Hours		**12**

- Students may submit documentation to use a course not listed above.
- All courses must be completed with a 'B' grade or higher.

GRADUATE EMBEDDED CERTIFICATE IN BIOROBOTICS

The Biorobotics Certificate program is offered through the School of Electrical and Computer Engineering. The program, an initiative resulting from the NSF Research Traineeship (NRT) program in healthcare robotics, is open to graduate students enrolled in any degree program at the Georgia Institute of Technology. The motivation for developing this certificate program is to encourage the development of bold, new, transformative, and scalable models for STEM graduate training in robotics.

The Biorobotics Certificate will equip each student with the fundamentals of robotics coupled with engineering, biological science, and ethics. It is an interdisciplinary program that expands opportunities for students in emerging field of biorobotics.

Program of Study

Code	Title	Credit Hours
Required courses		
ECE 7785	Introduction to Robotics Research	3
or BMED 77	Introduction to Robotics Research	
or ME 7785	Introduction to Robotics Research	
ECE 8750	Robotics Research Foundation I	3
or BMED 8750	Multidisciplinary Robotics Research I	
or ME 8750	Robotics Research Foundation I	
Electives		**6**
BMED 8813	Special Topics	
BMED 6739	Medical Robotics	
PHIL 6710	Ethics of Biotechnology and Bioengineering Research	
ECE 6781	Biomedical Sensing Systems	
ECE 8823	Special Topics (Clinical Experiences for Engineers)	
or BMED 8823	Special Topics	
ME 8843	Special Topics in Automation and Mechatronics (Automation)	
APPH 6231	Biomechanical Aspects of Human Motor Control	
APPH 6232	Locomotion Neuromechanics	
APPH 6236	Neuromuscular Physiology	
APPH 6400	Human Neuroanatomy	
APPH 6746	Rehabilitation Engineering	
or ME 6746	Rehabilitation Engineering	
Total Credit Hours		**12**

The requirements outlined below are supplemental to the certificate requirements established by the Georgia Institute of Technology:

- Student must complete a graduate degree in any academic unit of the Georgia Institute of Technology
- Student must complete two Biorobotics core courses, both with a grade of B or higher
- Student must complete two Biorobotics electives, both with a grade of B or higher

GRADUATE EMBEDDED CERTIFICATE IN GEOGRAPHIC INFORMATION SYSTEMS

The Certificate in GIS is highly consistent with Georgia Tech's mission of equipping graduate students with technological expertise related to their chosen field of employment. Specific professional fields in which GIS is an important skillset include land use planning and development, environmental management, transportation planning and engineering, and economic development, among other fields.

For more information, click here.

Program of Study

Code	Title	Credit Hours
CP 6521	Advanced Geographic Information Systems	3
Select two (2) skills courses:		6
CP 6531	Introduction to Remote Sensing	
CP 6541	Environmental Analysis Using GIS	
CP 6542	Transport & GIS	
CP 6551	Spatial Analysis of Socioeconomic Data	
Select one (1) policy context course:		3
CP 6112	Introduction to Land Use Planning	
CP 6213	Urb Env Plan & Design	
CP 6311	Introduction to Transportation Planning	
CP 6412	Foundations of Local Economic Development Planning and	
CP 6611	Principles of Real Estate Finance and Development	
CP 6832	Introduction to Urban Design	
Total Credit Hours		**12**

GRADUATE EMBEDDED CERTIFICATE IN INDUSTRIAL DESIGN FUNDAMENTALS

The graduate certificate in Industrial Design Fundamentals is offered to degree seeking masters and doctoral students in the College of Design. Upon successful completion of the Certificate, students will matriculate through the MID program. The Certificate is also intended as an entry point into the Ph.D. program for doctoral students without a Design background. Additionally, it will be offered to MS-HCI-ID applicants looking to create a design portfolio.

Upon successful completion of this certificate students are expected to;

- Apply user centered design methods to assignments
- Develop basic design skills of drawing, prototyping and presentation
- Create a design portfolio of class projects

Program of Study

Code	Title	Credit Hours
ID 6102	Graduate Studio A	4
ID 6104	Drawing	2
ID 6105	Brand and Visual Design	3
ID 6109	Human Factors and Ergonomics	3
ID 6103	Graduate Studio B	4
ID 6106	3D Design Methods	2
ID 6107	Integrated Product Design	3
ID 6108	Survey of Industrial Design History	3
Total Credit Hours		**24**

GRADUATE EMBEDDED CERTIFICATE IN MECHANICAL PROPERTIES OF MATERIALS

Graduate students conducting research within the Mechanical Properties Research Laboratory (MPRL) are strongly encouraged to pursue the multidisciplinary certificate in Mechanical Properties of Materials, administered through the College of Engineering. This certificate is awarded along with the graduate degree, and denotes a specialty in mechanical properties and affiliation with the MPRL that may be useful in seeking future employment opportunities in addition to providing a well-balanced educational program.

A multidisciplinary certificate program consisting of coursework in which graduate students from participating Schools in the College of Engineering may participate to obtain an in-depth understanding of mechanical behavior and properties. The program is entitled "A Certificate in Mechanical Properties of Materials" and is administered through the Mechanical Properties Research Laboratory (MPRL) to graduate students in participating Schools in the College of Engineering.

The courses in the certificate program provide students with fundamentals of mechanical behavior as well as with advanced practical information on design and materials selection. As such, it supports their research programs in the MPRL and various academic units. This certificate program also meets the needs of industry for high-level practitioners for which materials/mechanics considerations are primary design obstacles.

This multidisciplinary certificate presently involves faculty members from the Schools of Aerospace Engineering, Materials Science and Engineering, and Mechanical Engineering, though others outside of these schools can qualify if they meet the requirements of the certificate program.

In consultation with his/her advisor, the student selects courses that constitute a coherent sequence from an approved list (see attached forms). The student then sends the proposed program to the MPRL Director for review and approval. Upon successful completion of the program, a recommendation is forwarded by the MPRL Director to the Dean of Engineering for final approval similar to other existing certificate programs.

Program of Study

Code	Title	Credit Hours
Core Courses		**3**
ME/MSE/CEE/AE 7772	Fundamentals of Fracture Mechanics	
ME/MSE/CEE/AE 7774	Fatigue of Materials and Structures	
Other courses		**9**
ME/MSE/CEE/AE 7773	Advanced Fracture Mechanics	
ME/AE 7775	Topics in Fracture and Fatigue of Metallic and Composite Structures [1]	
ME 6203	Inelastic Deformation of Solids	
MSE 7210	Dislocation and Deformation Mechanics	
ME/MSE/CHBE 7771	Mechanics of Polymer Solids and Fluids	
ME/CEE/CHBE/AE 4791	Mechanical Behavior of Composites	
ME/MSE/CEE/CHBE/AE 7791	Damage, Failure, and Durability of Composite Materials	
ME/MSE/CHBE 6768	Polymer Structure, Physical Properties, and Characterization	
ME 6796/6796	Structure-Property Relationships in Materials	
ME/MSE/AE/CHBE 8803	Special Topics in Manufacturing [2]	
Total Credit Hours		**12**

1 Not allowed if ME 7774 is taken as a core course.

2 Special Topics courses as approved by certificate administration.

GRADUATE EMBEDDED CERTIFICATE IN MICRO ELECTRO MECHANICAL SYSTEMS

Micro Electro Mechanical Systems (MEMS) is an interdisciplinary field related to technologies used to fabricate nano to microscale devices and system-on-a-chip. The MEMS devices and systems embed electrical, mechanical, chemical, and hybrid mechanisms to realize devices and systems for a broad array of applications such as physical sensors, biomedical systems, and complex multi-functional nano-micro systems. MEMS combine expertise from many disciplines, including but not limited to all fields of engineering, biology, chemistry, informatics, medicine, and physics.Typical MEMS devices combine sensing, processing and/or actuating functions.They typically combine two or more electrical, mechanical, biological, magnetic, optical orchemical properties on a single microchip.

The objective of the program is to provide a means for students interested in this interdisciplinary field a mechanism to obtain a concentration in MEMS and to gain acknowledgement for this achievement.

Program of Study

Code	Title	Credit Hours
CHBE/ECE/ME 6229	Introduction to MEMS	3
CHBE/ECE/ME 6460	Microelectromechanical Devices	3
Select two (2):		6
CHBE 6710	Microfluidics & Appl	
ECE 6422	Interface IC Design for MEMS and Sensors	
ECE 6450	Introduction to Microelectronics Technology	
ECE 6200	Biomedical Applications of Microelectromechanical Systems	
ME 6124	Finite-Element Method: Theory and Practice	
ME 6449	Acoustic Transducers and Signal Analysis	
ME 6776	Integrated Low-cost Microelectronics Systems Packaging	
ME 8833	Special Topics in Thermal Sciences (Thin Film Properties)	
Total Credit Hours		**12**

GRADUATE EMBEDDED CERTIFICATE IN PUBLIC POLICY

The School of Public Policy offers a certificate in public policy to Ph.D. students from other Schools around campus. The goal of the certificate program is to provide a basic but well-rounded introduction to public policy thinking to Georgia Tech graduate students. The program is designed to address the needs of scientists, engineers, management scholars and others who seek to be more aware of policy, regulatory, ethical, and societal implications of science, technology and innovation. The program will provide breadth and context for those entering employment in any sector. The courses in the program explore the processes through which policy is made.

Although this certificate is not available to policy students, the courses are open to all graduate students, creating an opportunity for students to gain value from divergent perspectives.

For more information, click here.

Program of Study

Code	Title	Credit Hours
Required courses, choose one (1):		**3**
PUBP 6012	Fundamentals of Policy Processes	
PUBP 6201	Public Policy Analysis	
Electives		**9**
Analytical Methods		
PUBP 6112	Research Design in Policy Science	
PUBP 6114	Applied Policy Methods and Data Analysis	
Economic Development		
PUBP 6602	Economic Development Analysis and Practice	
PUBP 6606	Urban Development Policy	
PUBP 6415	Technology, Regions, and Policy	
PUBP 6600	Foundations of Local Economic Development Planning and Policy	
PUBP 6740	Innovation, the State and Industrial Development in International Perspecitve	
PUBP 6741	Geography of Innovation	
Economics for Public Policy		
PUBP 6116	Microeconomics for Policy Analysis	
PUBP 6118	Public Finance Policy	
Ethics and Values		
PUBP 6010	Ethics, Epistemology, and Public Policy	
PUBP 6326	Environmental Values and Policy Goals	
Environmental & Energy Policy		
PUBP 6310	Environmental Issues	
PUBP 6312	Economics of Environmental Policy	
PUBP 6314	Policy Tools for Environmental Management	
PUBP 6326	Environmental Values and Policy Goals	
PUBP 6327	Sustainability and Environmental Policy	
PUBP 6701	Energy Technology Policy	
Information Technology		
PUBP 6111	Internet and Public Policy	
PUBP 6501	Information Policy and Management	
PUBP 6502	Information and Communications Technology Policy	
Public Administration		
PUBP 6014	Organization Theory	
PUBP 6017	Public Management	
PUBP 6018	Policy Implementation and Administration	
PUBP 6226	Business and Government	
Science and Technology Policy		
PUBP 6401	Science, Technology, and Public Policy	
PUBP 6402	Research Policy and Management	
PUBP 6403	Scientific Careers and Workplaces	
PUBP 6417	Critical Perspectives on Science and Technology	
PUBP 6440	Science, Technology, and Regulation	
PUBP 6753	Comparative Science and Technology Policy	
PUBP 8803	Special Topics	
Total Credit Hours		**12**

GRADUATE EMBEDDED CERTIFICATE IN REMOTE SENSING

Remote sensing refers to a means of investigating the properties of a target using measurements made at some distance from the target. Applications range from astronomy and environmental applications to medical radiography and automotive collision avoidance radars, as well as security-enhancing sensors. In the last three decades, sensing of the Earth and its atmosphere has increased very substantially because of climate change and global pollution concerns and because of the need for measurements to support the increasingly sophisticated weather and earthquake forecasting and oil and gas surveying capabilities.

Students completing the master's or doctoral degree requirements of the Schools listed below may be awarded a Remote Sensing Certificate. The primary administration of the certificate is through Dr. Irina Sokolik of the School of Earth and Atmospheric Sciences. Departmental contacts are listed below:

Aerospace Engineering: Dr. Robert Braun
Electrical and Computer Engineering: Dr. Manos Tentzeris
Earth and Atmospheric Sciences: Dr. Irina Sokolik
Civil and Environmental Engineering: Dr. Michael Bergin
Chemistry and Biochemistry: Dr. Thomas Orlando
City Planning: Dr. Steven French

The courses that would be used to satisfy the requirements of this certificate have been divided into two areas:

1. First, a group of core courses that cover both fundamentals and applications of remote sensing;
2. Second, elective courses that cover a range of courses that cover fundamental physics, data analysis methods, and application areas.

A total of twelve credit hours are required to obtain the certificate, including at least two core courses. Nine of the credit hours must be at the 6000 level or above.

Area 1: Core Courses

Code	Title	Credit Hours
CP 6531	Introduction to Remote Sensing	3
EAS 4430	Remote Sensing and Data Analysis	3
EAS 4460	Satellite and Radar Meteorology	3
EAS 6145	Remote Sensing of the Atmosphere and Oceans	3

Area 2: Electives

Code	Title	Credit Hours
AE 6353	Orbital Mechanics (AE 6353 is a pre-requisite for AE 6354)	3
CEE 6222	Hydrometeorology	3
CEE 6462	Signals and Inverse Problems in Civil Engineering	3
CEE 6483	Geotechnical Image and Spatial Analysis	3
CP 6521	Advanced Geographic Information Systems	3
EAS 4510	Exploration Geophysics	3
EAS 4520	Seismic Methods in Exploration Geophysics	3
EAS 6134	Inverse Methods and Time Series Analysis in Earth and Atmospheric Sciences	3
EAS 8803	Special Topics (may be taught as Atmospheric Radiative Transfer)	3
EAS 8803	Special Topics (may be taught as Optical Techniques in Atmospheric Sensing)	3
ECE 6272	Fundamentals of Radar Signal Processing	3
ECE 6780	Medical Image Processing	3

Courses in Development

AE/EAS 4XXX: Designing a UAV for Remote Sensing Applications - This course is currently being planned and EAS recently received a NASA grant to provide education in this subject area.

EAS 6XXX: Earth Science/Geological Applications of Remote Sensing - A new faculty member in EAS geodetic remote sensing will be creating this course. It probably will include Global Positioning System (GPS) applications

Other new courses on remote sensing may qualify as electives for this certificate with approval by the Remote Sensing Certificate, Dr. Irina Sokolik.

GRADUATE EMBEDDED CERTIFICATE IN SCIENCE, TECHNOLOGY, AND SOCIETY

Graduate Certificate in Science, Technology, and Society Science, Technology and Society (STS) - also called Science and Technology Studies - is an interdisciplinary field of study that seeks to understand how science and technology shape society and culture and how society and culture, in turn, shape the development of science and technology. The STS Graduate Certificate is designed for students already enrolled in a graduate degree program at Georgia Tech, in any college or program. This certificate is for graduate students who would like to demonstrate additional competence in some aspect of STS or special competence in STS in their home discipline. The certificateis open to students in good standing in any graduate program at Georgia Tech.

The certificate program helps students to:

•Understand the social, cultural, and epistemic dynamics of science and technology

•Explore these dynamics across world societies and cultures

•Develop sensitivity to issues of gender, race, and justice across areas of knowledge, including: engineering,

medicine, environment, cognition, security, innovation, design

•Employ STS approaches as scholars or practitioners (e.g. engineers, scientists, or policy makers)

For more information, click here.

Program of Study

Code	Title	Credit Hours
Core Course		
HTS/PUBP/LMC 6743	Science, Technology & Soceity: Core Seminar	3
Official STS electives [1]		**9**
HTS 6118	Sci Tech and the Economy	
HTS 6121	Science, Technology, and National Security [2]	
HTS 6123	Social and Cultural Studies of Biomedicine [3]	
HTS 6124	Science and Technology Beyond Borders	
PUBP/LMC 6748	Social Justice, Critical Theory, and Philosophy of Design	
PUBP/LMC 6749	Feminist Theory and Science and Technology Studies	
Total Credit Hours		**12**

1 Students may choose 2-3 STS electives or 2 STS electives and up to 1 other elective subject to student interest and STS Coordinator approval.

2 May also take INTA 8803 with the title of Science, Technology, & Security

3 May also take INTA 8803 with title Social & Cultural Studies of Biomedicine

GRADUATE STAND-ALONE CERTIFICATE IN BUSINESS ANALYTICS

Code	Title	Credit Hours
MGT 6213	Business Analytics for Managers	3
MGT 6655	Business Data Preparation and Visualization	3
MGT 6452	Machine Learning for Business	3
MGT 8803	Special Topics in Management (Analysis of Unstructured Data)	3
Total Credit Hours		**12**

See Graduate Certificate Guidelines for more information.

GRADUATE STAND-ALONE CERTIFICATE IN DATA SCIENCE FOR THE CHEMICAL INDUSTRY

The objective of this certificate is to provide engineers in the chemical industry with knowledge of basic data science and machine learning techniques, and experience applying these techniques to specific problems in chemical engineering.

General Guidelines for Certificates:

- All courses must be taken for Letter-grade
- All courses must be completed with a grade of 'C' or higher
- Certificates requirement a minimum GPA of 2.7

Code	Title	Credit Hours
Core Courses		
CHBE 6745	Data Analytics for Chemical Engineers	3
CHBE 6746	Data-Driven Process Systems Engineering	3
Electives		**6**
CS 6035	Introduction to Information Security	
CS 6220	Big Data Systems and Analytics	
CS 6400	Database Systems Concepts and Design	
CS 6421	Temporal, Spatial and Active Databases	
CS 6430	Parallel and Distributed Database Systems and Applications	
CS 6601	Artificial Intelligence	
CS 7641/ CSE 6740/ ISYE 6740	Machine Learning	
CSE 6040	Computing for Data Analysis: Methods and Tools	
CSE 6140	Computational Science and Engineering Algorithms	
CSE 6242	Data and Visual Analytics	
ISYE 6402	Time Series Analysis	
ISYE 6413	Design and Analysis of Experiments	
ISYE 6414	Statistical Modeling and Regression Analysis	
ISYE 6416	Computational Statistics	
ISYE 6420	Introduction to Theory and Practice of Bayesian Statistics	
ISYE 6501	Intro Analytics Modeling	
ISYE 6644	Simulation	
ISYE 6662	Discrete Optimization	
ISYE 6664	Stochastic Optimization	
ISYE 6740	Computational Data Analysis: Learning, Mining, and Computation	
ISYE 6810	Systems Monitoring and Prognostics	
ISYE 7201	Production and Service Systems Engineering	
ISYE 7203	Logistics Systems Engineering	
ISYE 7406	Data Mining and Statistical Learning	
ISYE 8803	Special Topics (Topics on High-Dimensional Data Analytics)	
MGT 6203	Data Analytics in Business	
MGT 8823	Special Topics in Mgt (Data Analysis for Continuous Improvement)	
PUBP 6501	Information Policy and Management	
PUBP 6725	Information Security Policies and Strategies	
Total Credit Hours		**12**

GRADUATE STAND-ALONE CERTIFICATE IN EMERGING TECHNOLOGIES AND PROLIFERATION

GRADUATE STAND-ALONE CERTIFICATE IN INTERNATIONAL SECURITY AND AEROSPACE SYSTEMS

The International Security and Aerospace Systems Certificate is a 12-credit hour program offered by the Sam Nunn School of International Affairs and the Guggenheim School of Aerospace Engineering.
The interdisciplinary certificate is for graduate students and post-baccalaureate professionals studying on a non-degree basis. Students will take courses that explore the intersection of international security, military gaming and modeling, and aerospace systems. The certificate will provide students with technical knowledge of aerospace systems and an understanding of relevant political and strategic context.

Program of Study

All courses counting toward the certificate must be taken on a letter-grade basis and be completed with a grade of C or higher with a minimum GPA of 2.7 for the certificate.

Code	Title	Credit Hours
Required courses:		
INTA 6103	International Security	3
AE 6393	Introduction to System of Systems Engineering Principles	3
AE 6394	System of Systems Engineering Applications	4
Select one (1) of the following:		3
INTA 6014	Scenario Writing and Path Gaming	
INTA 6742/ CX 4232/ CSE 6742	Modeling, Simulation and Military Gaming	
Total Credit Hours		**13**

GRADUATE STAND-ALONE CERTIFICATE IN GLOBAL DEVELOPMENT

The multidisciplinary Graduate Certificate in Global Development is a 12-credit hour program for degree-seeking graduate students and post-baccalaureate students studying on a non-degree basis.

The program provides graduate level introductory exposure to principles and methods of international economic and urban development through courses offered in the Sam Nunn School of International Affairs, the School of City and Regional Planning, and the School of Economics.

Upon completion, students will be positioned to influence technological, social, and policy decisions in their professions in the global context.

Certificate guidelines:

- The total hours for the certificate is 12 credit hours.
- Students must earn a GPA of 2.7 or higher in certificate courses
- Courses must be completed with a 'C' grade or higher
- All courses must be taken for Letter-grade
- Students are required to complete at least one course in each of two of the three coordinating academic departments (City and Regional Planning, Economics, International Affairs)

Code	Title	Credit Hours
Core Courses		
INTA/ECON 6704	Introduction to Global Development	3
CP 6052	Applied Planning Studio [1]	3-4
or CP 6053	Applied Planning Studio (Urban Design)	
or INTA 8803	Special Topics	
or ECON 8803	Special Topics	
Electives		**5-6**
CP 6112	Introduction to Land Use Planning	
CP 6217	Climate Change and the City	
CP 6190	Introduction to Climate Change Planning	
CP 6233	Sustainable Urban Development	
CP 6514	Introduction to Geographic Information Systems	
CP 6412	Foundations of Local Economic Development Planning and	
or PUBP	Foundations of Local Economic Development Planning and Policy	
CS 6422	Database System Implementation	
CP 6570	Socioeconomic GIS	
CP 6541	Environmental Analysis Using GIS	
CP 6422	Economic Development Analysis and Practice	
CP 6442	Equity, Social Justice, and Economic Development	
CP 6241	Water Resources Planning	
CP 6311/ CEE 6602	Introduction to Transportation Planning	
CP 6321	Transportation Planning Methods and Investment Decisions	
CP 6831	Urban Growth and Infrastructure Systems	
CP 6611	Principles of Real Estate Finance and Development	
CP 6612	Community Development	
CP 6630	Government and Housing Markets	
CP 6640	Applied Real Estate Development Methods	
CP 6680	Citizen Participation and Community Engagement	
CP 6032	Urban and Regional Development Theory	
CP 6331	Land Use and Transportation Interaction	
CP 6834	Urban Design Policy: Analysis and Implementation	
CP 6836	Urban Ecological Design	
CP 8300	Advanced Urban and Regional Development Theory	
ECON 4415/ INTA 8803	Conflict and Security in Developing Countries	
ECON 6360	Development Economics	
ECON 6650	International Economics and Policy Analysis	
ECON 6330	Urban and Regional Economics	
ECON 6341	Transportation Economics	
ECON 8803	Special Topics (The World Trading System: Law, Economics, and Corporate Strategy)	
INTA 6003	Empirical Research Methods	
INTA 6202	Comparative Politics	
INTA 6302	International Political Economy	
INTA 6740	Innovation, the State and Industrial Development in International Perspective	
INTA/CS 6745	Information and Communication Technologies and Global Development	
INTA 6753	Comparative Science and Technology Policy	
INTA 8803	Special Topics (Political Economy of Development)	

[1] Special Topics must be 'Global Development Capstone'

GRADUATE STAND-ALONE CERTIFICATE IN SUSTAINABLE ENERGY AND ENVIRONMENTAL MANAGEMENT

The Certificate in Sustainable Energy and Environmental Management (CSEEM) curriculum is a multidisciplinary program with courses taught in schools across Georgia Tech including Public Policy, Business, City and Regional Planning, Civil and Environmental Engineering, and Economics, among others.

Program of Study

Code	Title	Credit Hours
Required courses		
PUBP 6312	Economics of Environmental Policy	3
PUBP 8803	Special Topics (Sustainable Energy & Environmental Management)	3
Quantitative Methods course		**3**
Sustainable Energy and Environmental Mangement or Policy & Management course		**3**
Total Credit Hours		**12**

Code	Title	Credit Hours
Quantitative Methods course list		
PUBP 6114	Applied Policy Methods and Data Analysis	3
PUBP 6218	Quantitative Models in Public Policy	3
PUBP 6530	Introduction to Geographic Information Systems	3
PUBP 8200	Advanced Research Methods I	3
PUBP 8205	Advanced Research Methods II	3
PUBP 6352	Utility Regulation and Policy	3
PUBP 8813	Special Topics (Big Data & Public Policy)	3
CETL 6490	Advanced Environmental Data Analysis	3
CP 6541	Environmental Analysis Using GIS	3
MGT 6203	Data Analytics in Business	3
MSE 6759	Materials in Environmentally Conscious Design and Manufacturing	3

Code	Title	Credit Hours
Sustainable Energy & Environmental Management/Policy & Management course list		
Sustainable Energy & Environmental Management courses		
PUBP 6300	Earth Systems	3
PUBP 6310	Environmental Issues	3
PUBP 6326	Environmental Values and Policy Goals	3
PUBP 6327	Sustainability and Environmental Policy	3
PUBP 6330	Environmental Law	3
PUBP 6350	Energy Policy & Markets	3
PUBP 6701	Energy Technology Policy	3
PUBP 8803	Special Topics (Sustainability & Envrionmental Policy)	3
PUBP 8803	Special Topics (Smart Cities)	3
PUBP 8803	Special Topics (Environmental Finance)	3
PUBP 8833	Special Topics (Utility Regulation & Policy)	3
AE 8803/4803	Special Topics (Energy Efficiency and Environmental Impacts)	3
ARCH 6531	Environmental Systems I	3
BC 6002	Issues in Sustainable Construction Technology	3
BC 6731	Zero Energy Housing	3
CEE 4300	Environmental Engineering Systems	3
CEE 4395	Environmental Systems Design Project	3
CEE 4620	Environmental Impact Assessment	3
CEE 6314	Fundamentals of Environmental Modeling and Mathematics	3
CEE 6345	Sustainable Engineering	3
CEE 6390	Air Pollutant Formation and Control	3
CEE 6625	Transportation, Energy, and Air Quality	3
CEE 6790	Air Pollution Physics and Chemistry	3
CHBE 8803 or CHBE 48	Special Topics (Chem Eng of Energy Systems) Special Topics	3
CHEM 8833	Special Topics in Organic Chemistry (Fundamentals and Challenges for a Sustainable Chemical Enterprise)	3
CP 6190	Introduction to Climate Change Planning	3
CP 6213	Urb Env Plan & Design	3
CP 6214	Environmental Planning and Impact Assessment	3
CP 6217	Climate Change and the City	3
CP 6233	Sustainable Urban Development	3
EAS 6132	Introduction to Climate Change	3
EAS 6135	Introduction to Complex Environmental Systems	3
EAS 8803	Special Topics (Climate and Global Change)	3
EAS 8803	Special Topics (Environmental Geochemistry)	3
ECON 6380	Economics of Natural Resources and the Environment	3
ECON 7032	Macroeconomics of Innovation	3
HTS 6116	The Environment in World History	3
INTA 8803	Special Topics (Energy & International Security)	3
MGT 6369	Sustainable Business Practicum	3
MGT 6359	Business Strategies For Sustainability	3
Policy & Management courses		
PUBP 6010	Ethics, Epistemology, and Public Policy	3
PUBP 6012	Fundamentals of Policy Processes	3
PUBP 6017	Public Management	3
PUBP 6018	Policy Implementation and Administration	3
PUBP 6116	Microeconomics for Policy Analysis	3
PUBP 6118	Public Finance Policy	3
PUBP 6201	Public Policy Analysis	3
PUBP 6221	Policy and Program Evaluation	3
PUBP 6314	Policy Tools for Environmental Management	3

PUBP 6326	Environmental Values and Policy Goals	3
PUBP 6327	Sustainability and Environmental Policy	3
PUBP 6330	Environmental Law	3
PUBP 6350	Energy Policy & Markets	3
PUBP 6701	Energy Technology Policy	3
PUBP 8540	Advanced Environmental Policy	3
PUBP 8803	Special Topics (Sustainablity, Technology, & Policy)	3
PUBP 8813	Special Topics (Climate Policy)	3
CP 6223	Policy Tools for Environmental Management	3
CP 6261	Environmental Law	3

GRADUATE STAND-ALONE CERTIFICATE IN MEDICAL PHYSICS

Master of Science in Aerospace Engineering

At the graduate-level, the School of Aerospace Engineering offers master's and doctoral degrees. In addition, the School offers a distance learning-based master's degree.

The master's degree may be earned by completing 33 semester hours of coursework, which must include 3 credit hours of Special Problems research credit. Alternatively, the candidate may elect to complete twenty-four semester hours of coursework along with nine hours of MS thesis work. In the latter option, the candidate must propose a thesis topic, complete the thesis, and successfully defend it before being awarded the degree. A GPA of 2.7 is required to graduate with an MS degree. All coursework, including Special Problems, must be taken on a letter-grade basis. The program of study for the master's degree is very flexible and can be tailored, in agreement with the student's advisor, to meet the candidate's professional goals.

For further details governing the graduate program, access the Aerospace Engineering Graduate Handbook at www.ae.gatech.edu. Graduate students may specialize in the following areas: aerodynamics and fluid mechanics, aeroelasticity and structural dynamics, flight mechanics and control, propulsion and combustion, structural mechanics and materials behavior, and system design and optimization. Further information on these areas of specialization and research can be found here.

The Master of Science in Aerospace Engineering is also offered online through the Distance Learning Program.

Non-Thesis Option

A GPA of 2.7 is required to graduate with an MS degree

Code	Title	Credit Hours
AE 8002	AE Graduate Seminar [1]	
Coursework [2,3]		
AE, other technical, and non-technical courses [4,5,6,7]		27
Mathematics [8]		6
Total Credit Hours		**33**

1. AE 8002 must be completed within first year
2. Must be taken on letter-grade basis
3. Twenty-four (24) hours minimum must be 6000-level or higher
4. A minimum of twelve (12) hours of AE courses (excluding AE 8900) is required.
5. A maximum of six (6) hours of non-technical courses may be used here. Non-technical are those outside of the College of Engineering, College of Sciences, and College and Computing.
6. Technical courses are those offered by the College of Engineering, College of Sciences, and College of Computing.
7. A maximum of three (3) hours of AE 8900 may be counted towards the 33 credit hour total.
8. Courses that may satisfy the Mathematics requirement: Any MATH 4000-level or higher, CS 7530, ECE 6601, ISYE 6413, ISYE 6414, ISYE 6416, ISYE 6650, ISYE 6739, PHYS 6124, PHYS 6125, PHYS 6268, PUBP 6114

Thesis Option

A GPA of 2.7 is required to graduate with an MS degree

Code	Title	Credit Hours
AE 8002	AE Graduate Seminar [1]	
Coursework [2,3]		
AE, other technical, and non-technical courses [4,5,6]		18
Mathematics [7]		6
Thesis		
AE 7000	Master's Thesis	9
Propose a thesis topic, complete the thesis, and successfully defend the thesis		
Total Credit Hours		**33**

1. AE 8002 must be completed within first year.
2. Must be taken on letter-grade basis.
3. Fifteen (15) hours minimum must be 6000-level or higher.
4. A minimum of nine (9) hours of AE courses (excluding AE 7000) is required.
5. A maximum of three (3) hours of non-technical courses may be used here. Non-technical are those outside the College of Engineering, College of Sciences, and College of Computing.
6. Technical courses are those offered by the College of Engineering, College of Sciences, and College of Computing.
7. Courses that may satisfy the Mathematics requirement: Any MATH 4000-level or higher, CS 7530, ECE 6601, ISYE 6413, ISYE 6414, ISYE 6416, ISYE 6650, PHYS 6125, PHYS 6268, PUBP 6114.

BS/MS Honors Program

A combined BS/MS honors program is also offered that prepares students for graduate studies and research. Please see www.ae.gatech.edu for more information.

Master of Science in Analytics

The Master of Science in Analytics is an interdisciplinary program that combines statistics, operations research, computing, and business by melding the world-class expertise of the College of Engineering's Stewart School of Industrial & Systems Engineering, the College of Computing's School of Computational Science and Engineering, and the Scheller College of Business. By combining the strengths of these nationally ranked programs, graduates will be afforded the opportunity to integrate analytic skills in a unique and interdisciplinary way that yields deep insights into analytics problems.

Analytics is defined as "the scientific process of transforming data into insight for making better decisions." Tying together the new opportunities made possible by big data and computing, advanced quantitative methods from statistics and operations research, and the need for better business intelligence and decision support, analytics has quickly become

a key facet of business strategy The MS Analytics program's graduates will be able to move directly into business, industry, and government positions where they can apply the practical knowledge they have gained to immediately benefit their employers.

Students earning the MS Analytics degree will be able to understand and integrate fundamental principles and advanced concepts across the core analytics disciplines of computing, statistics, operations research, and business. Trained by world-class faculty in all of these areas, students will learn

- identification and framing of problems;
- acquisition, management, and utilization of large and fast-moving streams of data;
- creation, analysis, solution, and interpretation of mathematical models using appropriate methodology; and
- the integration of these interdisciplinary skills to enable graduates to successfully develop and execute analytics projects.

In addition to an integrated breadth of study covering the core areas of analytics, students will satisfy one of the specialized tracks to give them depth in an analytics area of specialization:

Analytical Tools Track

The Analytical Tools track provides students with a greater understanding of the quantitative methodology of analytics: how to select, build, solve, and analyze models using methodology such as parametric and non-parametric statistics, regression, forecasting, data mining, machine learning, optimization, stochastics, and simulation.

Business Analytics Track

The Business Analytics track provides students with a deeper understanding of the practice of using analytics in business and industry: how to understand, frame, and solve problems in marketing, operations, finance, management of information technology, human resources, and accounting in order to develop and execute analytics projects within businesses.

Computational Data Analytics Track

The Computational Data Analytics track provides students with a deeper understanding of the practice of dealing with so-called "big data": how to acquire, preprocess, store, manage, analyze, and visualize data arriving at high volume, velocity, and variety

Prerequisites

The prerequisites of the MS Analytics program include:

1. Interest in analytics, and a high level of ability that has been demonstrated within past performance on appropriate coursework and/or industry experience as well as standardized testing (GRE or GMAT);
2. Basic mathematical background - at least one college-level course in each of calculus, basic linear algebra, and probability and statistics;
3. Basic computing background - at least one college-level course (or equivalent basic knowledge) in computer programming using a high-level language such as Python;
4. A bachelor's degree or equivalent; and
5. Institute requirements for admission to graduate study.

Applicants who do not satisfy these prerequisites might still be admitted, as long as they will have all of the prerequisites by the time they start the program.

Code	Title	Credit Hours
Introductory Core Requirements [1]		
CSE 6040	Computing for Data Analysis: Methods and Tools	3
MGT 8803	Introduction to Business for Analytics	3
ISYE 6501	Intro Analytics Modeling	3
Advanced Core		
CSE 6242	Data and Visual Analytics	3
MGT 6203	Data Analytics in Business	3
Statistics		
Select two courses from the approved list [2]		6
Operations Research		
Select one course from the approved list [2]		3
Elective Courses		
Select 6-15 credit hours. [1,3]		6-15
Applied Analytics Practicum		
Select one of the following:		6
ISYE 6748	Applied Analytics Practicum	
CSE 6748	Applied Analytics Practicum	
MGT 6748	Applied Analytics Practicum	
Total Credit Hours		**36**

1 Students with sufficient background in this area may be allowed to substitute additional elective hours.

2 See http://analytics.gatech.edu for the full list. Online MS in Analytics see http://omsanalytics.gatech.edu for the full list

3 For the 6-15 semester hours of electives, students choose coursework to satisfy at least one of the three track requirements in analytical tools, business analytics, and computational data analytics. Students are encouraged to choose electives to develop specific expertise within an area of analytics where they have career interests. Courses available to the students either as core requirements or elective options include topics such as forecasting, regression analysis, data mining, statistical learning, machine learning, computational data analytics, design of experiments, simulation, optimization, probabilistic models, data analytics, visualization, databases, text mining, algorithms, high performance computing, graph analytics, business intelligence, pricing analytics, revenue management, business process analysis, financial analysis, decision support, privacy and security, and risk analytics. See http://analytics.gatech.edu for the full list. Online MS in Analytics see http://omsanalytics.gatech.edu for the full list.

The Master of Science in Analytics is also offered online.

For more information, visit: Online Master of Science in Analytics.

Master of Architecture (M.Arch.)

The M.Arch is a STEM-designated professional practice program of architecture that leads to licensure in architecture and is fully accredited

by the National Architectural Accrediting Board (NAAB). This degree option provides flexibility for students who have an undergraduate degree with a major in architecture as well as those who have a degree in a field other than architecture. The M.Arch. Program requires a minimum of 60 credit hours and a maximum of 102 credit hours of study, depending upon the applicant's prior education in architecture and the amount of advanced standing credit granted upon admission to the program.

Normally, a student admitted to the program with maximum advanced standing can expect to complete the program within two academic years of full-time study. A student admitted to the program with no advanced standing can expect the program to require three and one-half academic years of full-time study. Graduates from four-year undergraduate programs in architecture similar to that at Georgia Tech can normally expect to complete the program in two academic years, provided they have pursued architecturally related elective coursework during their undergraduate years. Specific information regarding applications for advanced standing and degree requirements is available from the School of Architecture.

Multidisciplinary studies are strongly encouraged in all of the master's programs in architecture. These studies may be part of a formal dual degree program, including architecture and city and regional planning. Other multidisciplinary studies are possible within the College of Design, the Institute, or at other Atlanta area colleges and universities, such as Emory University and Georgia State University. Coursework outside the School of Architecture frequently includes city and regional planning, public policy, history, philosophy, real estate development, engineering, and studio art.

The deadline for applications is December 31st for all applicants for the following fall semester. Each applicant must have an outstanding undergraduate record and must submit a portfolio of creative work. The TOEFL is the only acceptable language test for admission to Georgia Tech. A score of 90 is required by Georgia Institute of Technology, with a minimum section score of 19 in each section of the test, however, the School of Architecture only accepts TOEFL scores near 100 for all foreign applicants. All applicants should be aware that each program in the School of Architecture has specific application requirements; therefore, all applicants should consult the relevant requirements for their chosen degree programs; by visiting the School of Architecture website or contacting an academic advisor.

The maximum requirements for the M.Arch. degree (total of 102 hours), for a student with a previous degree in a discipline other than architecture (3.5-year program), are as follows:

First Year		
Summer		**Credit Hours**
ARCH 6028	Core 1 Studio	5
ARCH Professional Elective		3
	Credit Hours	**8**
	Total Credit Hours	**8**

First Year		
Fall		**Credit Hours**
ARCH 6029	Core 2 Studio	5
ARCH 6105	Architectural History I - Antiquity through the 18th Century	3
ARCH 6229	Construction Technology and Design Integration I	3
ARCH 6531	Environmental Systems I	3
ARCH 6010	Media + Modeling 1	3
	Credit Hours	**17**
	Total Credit Hours	**17**

First Year		
Spring		**Credit Hours**
ARCH 6030	Core 3 Studio	5
ARCH 6106	Architectural History II - 19th and 20th Century	3
ARCH 6020	Media + Modeling 2	3
ARCH 6015	Structures 1	3
ARCH Professional Elective		3
	Credit Hours	**17**
	Total Credit Hours	**17**

Second Year		
Fall		**Credit Hours**
ARCH 6039	Advanced Architectural Studio 1	6
ARCH 7350	Foundations of Architectural Theory	3
ARCH 7030	Media + Modeling 3	3
ARCH 7101	Integrated Building Systems 1	3
	Credit Hours	**15**
	Total Credit Hours	**15**

Second Year		
Spring		**Credit Hours**
ARCH 6040	Advanced Architectural Studio 2	6
ARCH 7102	Integrated Building Systems II	3
ARCH 8803	Special Topics (Design and Climate Change)	3
ARCH Theory Elective		3
	Credit Hours	**15**
	Total Credit Hours	**15**

Third Year		
Fall		**Credit Hours**
ARCH 6049	Design + Research Studio 1	6
ARCH Professional Elective		3
ARCH Practiced Focused Elective		3
ARCH 6315	Practice of Architecture I	3
	Credit Hours	**15**
	Total Credit Hours	**15**

Third Year

Spring		Credit Hours
ARCH 6050	Design + Research Studio 2	6
ARCH 7103	Integrated Building Systems III	3
ARCH 7151	History of Urban Form	3
ARCH Professional Elective		3
	Credit Hours	**15**
	Total Credit Hours	**15**

The maximum requirements for the M.Arch. degree (total of 60 hours with Full Advanced Placement), for a student with a previous degree in architecture (2-year program), are as follows:

First Year

Fall		Credit Hours
ARCH 6039	Advanced Architectural Studio 1	6
ARCH 6350	Theory of Architecture I	3
ARCH 6015	Structures 1	3
ARCH 7030	Media + Modeling 3	3
	Credit Hours	**15**
	Total Credit Hours	**15**

First Year

Spring		Credit Hours
ARCH 6040	Advanced Architectural Studio 2	6
ARCH 7350	Foundations of Architectural Theory	3
ARCH 8803	Special Topics (Design and Climate Change)	3
ARCH Professional Elective		3
	Credit Hours	**15**
	Total Credit Hours	**15**

Second Year

Fall		Credit Hours
ARCH 6049	Design + Research Studio 1	6
Practice Focused Elective		3
Theory Elective		3
ARCH 6315	Practice of Architecture I	3
	Credit Hours	**15**
	Total Credit Hours	**15**

Second Year

Spring		Credit Hours
ARCH 6050	Design + Research Studio 2	6
ARCH 7103	Integrated Building Systems III	3
ARCH 7151	History of Urban Form	3
ARCH Professional Elective		3
	Credit Hours	**15**
	Total Credit Hours	**15**

Students have an option to pursue two degrees by sharing a select number of credit hours. The Master of Architecture has an agreement with the School of City and Regional Planning for an option for students to earn a MCRP and MArch.

Master of City and Regional Planning and Master of Architecture
The curriculum consists of the core requirements for each of the two professional programs and, in addition, a set of dual requirements that focus upon urban design as a common ground linking the theory and practice of the two disciplines. The dual curriculum builds upon five major bodies of material:

- Design studios as a basis for exploring architectural, urban design and development issues utilizing theory, method and professional practice paradigms
- Urban history and design theory as a way of understanding the formal and architectural order of the city
- Economics and development methods as a basis for formulating development projects
- Process and methods as a means of understanding professional practice and of designing policies and strategies that can be implemented in a private market regulated by public bodies
- The performance of design interventions in achieving specified economic, social, and environmental objectives

Click here for more information about the MCRP/MArch Option

Master of Science in Architecture

The School of Architecture's Master of Science (M.S.) is a STEM-designated, non-professional degree program requiring a minimum of 30 semester hours of advanced study and is oriented toward advanced practice, scholarship, and research. Applicants may have previous degrees in architecture or other related fields. The program accepts students with a professional degree in a design or design-related field, as well as students with a baccalaureate degree in a non-design field who wish to pursue an area of study offered in the Master of Science in Architecture degree.

Concentrations:

1. Advanced Production
2. Building Information Systems
3. Design Computation
4. Health and Design
5. High Performance Buildings

Multidisciplinary studies are strongly encouraged in all of the master's programs in architecture. These studies may be part of a formal dual degree program, including architecture and city and regional planning. Other multidisciplinary studies are possible within the College of Design, the Institute, or at other Atlanta area colleges and universities, such as Emory University and Georgia State University. Coursework outside the School of Architecture frequently includes city and regional planning, public policy, history, philosophy, real estate development, engineering, and studio art.

The deadline for applications is December 31st for all applicants for the following fall semester. Each applicant must have an outstanding undergraduate record and must submit a portfolio of creative work. The TOEFL is the only acceptable language test for admission to Georgia Tech. A score of 90 is required by Georgia Institute of Technology, with

a minimum section score of 19 in each section of the test, however, the School of Architecture only accepts TOEFL scores near 100 for all foreign applicants. All applicants should be aware that each program in the School of Architecture has specific application requirements; therefore, all applicants should consult the relevant requirements for their chosen degree programs; by visiting the School of Architecture website or contacting an academic advisor.

For further details on the program, see www.arch.gatech.edu or contact an academic advisor in the School of Architecture.

The School of Architecture also offers a Master of Science in Urban Design (MSUD). For more information about this program, click here.

- Master of Science in Architecture - Advanced Production
- Master of Science in Architecture - Building Information Systems
- Master of Science in Architecture - Design Computation
- Master of Science in Architecture - Health and Design
- Master of Science in Architecture - High Performance Buildings

Master of Science in Applied Languages and Intercultural Studies

Integrating theory and practice, the Master of Science in Applied Languages and Intercultural Studies degree departs from traditional models of literary analysis and teaching methodology of most US institutions to prepare students of diverse career orientations, including non-profit, government and business sectors, to apply professional-level communication and critical intercultural skills necessary for negotiating within and between the social, technological and political contexts of other cultures and toward understanding the local impacts of globalization and the complex interdependent issues of sustainable development.

- Master of Science in Applied Languages and Intercultural Studies - French
- Master of Science in Applied Languages and Intercultural Studies - German
- Master of Science in Applied Languages and Intercultural Studies - Spanish

Additional languages will be added as they are approved by the Graduate Curriculum Committee

BS/MS Applied Languages and Intercultural Studies eligibility requirements:

1. Recommendation of two Modern Languages faculty members

2. Grade of 3.0 or higher in all BS-ALIS coursework as demonstrated through official GT transcript (as of 2019-20 Spanish coursework)

3. Oral proficiency level of at least Intermediate High according to American Council of the Teaching of Foreign Languages (ACTFL) standards and OPI assessment procedures. This will be determined by in-person interview or ACTFL phone test.

4. Students must apply by March 15 of their junior year, so as to be accepted into the program and enroll in the graduate version of the required Intercultural Seminar (Capstone) course in the spring of their senior year.

5. Student acceptance will be recommended by a Graduate Committee comprised of members of the language programs to which students apply.

6. Students must maintain at least a 3.0 GPA throughout the MS ALIS program.

Program of Study and BS/MS ALIS Curriculum:

Following the model of other BS/MS degrees at Georgia Tech, ALIS majors meeting and maintaining eligibility requirements for continuing with the BS/MS ALIS may double count up to 6 credit hours of language study at the 4000 level or higher toward both degrees. BS/MSALIS students must complete at least 146 hours (total hours for BSALIS = 122 credit hours and total hours for MSALIS = 30 credit hours equal 152 credit hours with 6 credit hours being shared = 146 credit hours. Students may double count a 6000-level elective (3 hours) and 6000-level Intercultural Seminar (3 hours) toward undergraduate and graduate requirements.

BS/MS ALIS students also 21 take credit hours of graduate electives (3 credits of this requirement will be completed at undergraduate level), of which 18 or more must be in the target language, while one advisor-approved course not in the target language is allowed (3 credit hours of graduate level coursework taken at the undergraduate level will satisfy both BSALIS ML elective and a MSALIS elective requirement). BS/MS students must also complete Intercultural Seminar (6500) that will satisfy both the undergraduate and graduate seminar requirement.

Master of Science in Applied Languages and Intercultural Studies - Spanish

Program of Study

Code	Title	Credit Hours
Required courses		
ML 6501	Theory and Foundations Seminar	3
SPAN 6500	Intercultural Seminar	3
SPAN 6503	Professional Portfolio Development	3
Electives [1]		**21**
Total Credit Hours		**30**

[1] Any 6000-level or higher Spanish course and up to one (1) graduate course not taught in the target language (as approved by advisor). Students may complete a 6-credit thesis option, a 3-to-6-credit internship abroad option, or use graduate electives.

Master of Science in Bioengineering

The BioE Program is interdisciplinary in that it is not a standalone academic unit like most departments or schools at Georgia Tech. This interdisciplinary graduate program offers advanced courses in bioengineering, engineering specialties, and life sciences combined with training in cutting-edge bioengineering research. The BioEngineering MS degree offered by all home schools with a thesis option requires the writing of a master's thesis on an independent study of a bioengineering research topic under the guidance of a bioengineering program faculty member. Bioengineering research focuses on the development of new or improved physical and mathematical concepts and techniques that may be applied to problems in medicine and biology, including the fundamental study of biological phenomena and development of new

medical devices. Some home schools also offer a coursework-only, non-thesis option.

Eight different academic units from the Colleges of Engineering, Computing, and Design make up the program. The BioE Program provides research opportunities for students with any participating program faculty, allowing tremendous diversity and flexibility for research topics and advisors.

Additional information is available at www.bioengineering.gatech.edu/.

Non-Thesis Option

The non-thesis option requires a total of 30 hours - all of which are coursework (no PassFail hours allowed).

At least 24 hours must be 6000-level or higher.

Students must complete course requirements with an average of at least a cumulative GPA of 3.0 or higher.

Code	Title	Credit Hours
Engineering Fundamentals		**6-9**
Biological Sciences		**6-9**
Engineering Mathematics		**3**
Technical Electives		**9**

Thesis Option

The thesis option requires a total of 30 hours - 21 hours of coursework (no PassFail hours allowed) and 7 hours of thesis work.

At least 15 hours must be 6000-level or higher.

Students must complete course requirements with an average of at least a cumulative GPA of 3.0 or higher.

Code	Title	Credit Hours
Engineering Fundamentals		**3-6**
Biological Sciences		**3-6**
Engineering Mathematics		**3**
Technical Electives		**9**
Thesis Hours		**7**

Master's thesis

A student pursuing a MS with a thesis option must complete a master's thesis, which can range from a design project to a fundamental research investigation. An oral defense will be scheduled on the subject matter for the Thesis and the field in which it lies. The thesis defense examination will be conducted by the M.S. Thesis Committee chosen by the student and the thesis advisor and approved by the Graduate Studies Committee and the Dean of Graduate Studies.

Coursework

The distribution of classes in the Engineering Fundamentals and Biological Sciences categories for an MS student is based on the student's prior training. For the thesis option, a student must take 2 of one category and 1 of the other (for a total of 3 courses); for the non-thesis option, a student must take 3 of one category and 2 of the other (for a total of 5 courses). Students should take the greater number of courses in the category that is most distant from their prior training. For example, a student pursuing a non-thesis MS who previously earned a BS in engineering should take 3 Biological Sciences classes and 2 Engineering Fundamentals classes, while a student pursuing a thesis MS who previously earned a BS in neuroscience should take 2 Engineering Fundamentals classes and 1 Biological Science class.

Code	Title	Credit Hours
Engineering Fundamentals		
AE 6760	Acoustics I	3
AE 6762	Applied Acoustics	3
AE 6766	Combustion	3
AE 6770	Energy and Variational Methods in Elasticity and Plasticity	3
AE 7772	Fundamentals of Fracture Mechanics	3
CEE 6251	Intermediate Fluid Mechanics	3
CEE 6504	Finite Element Method of Structural Analysis	3
CEE 7772	Fundamentals of Fracture Mechanics	3
CHBE 6100	Advanced Chemical Engineering Thermodynamics	3
CHBE 6200	Advanced Transport Phenomena, Fluid Mechanics, and Heat	3
CHBE 6220	Computational Fluid Dynamics: Applications in Environmental	3
CHBE 6250	Mass Transport through Solids	3
CHBE 6260	Transport Phenomena-Mass Transfer	3
CHBE 6300	Kinetics and Reactor Design	3
CHBE 6400	Advanced Process Control	3
CHBE 6768	Polymer Structure, Physical Properties and Characterization	3
CHBE 7772	Fundamentals of Fracture Mechanics	3
CHEM 6751	Physical Chemistry of Polymer Solutions	3
CS 6230	High-Performance Parallel Computing: Tools and Applications	3
CS 7641	Machine Learning	3
CS 7643	Deep Learning	3
ECE 4270	Fundamentals of Digital Signal Processing	3
ECE 4580	Computational Computer Vision	3
ECE 6130	Advanced VLSI Systems	3
ECE 6250	Advanced Digital Signal Processing	3
ECE 6254	Statistical Machine Learning	3
ECE 6255	Digital Processing of Speech Signals	3
ECE 6258	Digital Image Processing	3
ECE 6273	Methods of Pattern Recognition with Application to Voice	3
ECE 6350	Applied Electromagnetics	3
ECE 6360	Microwave Design	3
ECE 6370	Electromagnetic Radiation and Antennas	3
ECE 6380	Introduction to Computational Electromagnetics	3
ECE 6412	Analog Integrated Circuit Design	3
ECE 6414	Analog Integrated System Design	3
ECE 6435	Neuromorphic Analog VLSI Circuits	3
ECE 6442	Electronic Oscillators	3
ECE 6450	Introduction to Microelectronics Technology	3
ECE 6451	Introduction to the Theory of Microelectronics	3

ECE 6453	Theory of Electronic Devices	3
ECE 6460	Microelectromechanical Devices	3
ECE 6500	Fourier Techniques and Signal Analysis	3
ECE 6501	Fourier Optics and Holography	3
ECE 6520	Integrated Optics	3
ECE 6522	Nonlinear Optics	3
ECE 6542	Optoelectronics: Devices, Integration, Packaging, Systems	3
ECE 6550	Linear Systems and Controls	3
ECE 6552	Nonlinear Systems and Control	3
ECE 6553	Optimal Control and Optimization	3
ECE 6554	Adaptive Control	3
ECE 6556	Intelligent Control	3
ECE 6560	Partial Differential Equations in Image Processing and Computer Vision	3
ECE 6605	Information Theory	3
ECE 6606	Coding Theory and Applications	3
ECE 6771	Optoelectronics: Materials, Processes, Devices	3
ECE 6779	Thermal Engineering for Packaging of Micro and Nano Systems	3
ECE 7252	Advanced Signal Processing Theory	3
ISYE 6215	Models in Human-Machine Systems	3
ISYE 6223	Understanding and Supporting Human Decision Making	3
ISYE 6234	Measurement and Evaluation of Human-integrated Systems	3
ISYE 6650	Probabilistic Models and Their Applications	3
ISYE 6669	Deterministic Optimization	3
ME 6124	Finite-Element Method: Theory and Practice	3
ME 6201	Principles of Continuum Mechanics	3
ME 6203	Inelastic Deformation of Solids	3
ME 6204	Micromechanics of Materials	3
ME 6229	Introduction to Micro-Electro-Mechanical Systems	3
ME 6242	Mechanics of Contact	3
ME 6301	Conduction Heat Transfer	3
ME 6302	Convection Heat Transfer	3
ME 6303	Thermal Radiation Heat Transfer	3
ME 6304	Principles of Thermodynamics	3
ME 6305	Applications of Thermodynamics	3
ME 6401	Linear Control Systems	3
ME 6402	Nonlinear Control Systems	3
ME 6403	Digital Control Systems	3
ME 6405	Introduction to Mechatronics	3
ME 6407	Robotics	3
ME 6441	Dynamics of Mechanical Systems	3
ME 6442	Vibration of Mechanical Systems	3
ME 6443	Variational Methods in Engineering	3
ME 6449	Acoustic Transducers and Signal Analysis	3
ME 6452	Wave Propagation in Solids	3
ME 6601	Introduction to Fluid Mechanics	3
ME 6602	Viscous Flow	3
ME 6622	Experimental Methods	3
ME 6760	Acoustics I and II	3
ME 6762	Applied Acoustics	3
ME 6766	Combustion I	3
ME 6768	Polymer Structure, Physical Properties, and Characterization	3
ME 6769	Linear Elasticity	3
ME 6770	Energy and Variational Methods in Elasticity and Plasticity	3
ME 6779	Thermal Engineering for Packaging of Micro and Nano Systems	3
ME 6796	Structure-Property Relationships in Materials	3
ME 7751	Computational Fluid Mechanics	3
ME 7771	Mechanics of Polymer Solids and Fluids	3
ME 7772	Fundamentals of Fracture Mechanics	3
ME 7774	Fatigue of Materials and Structures	3
MSE 6130	Surface Analysis	3
MSE 6310	Thermodynamics and Kinetics of Transformations	3
MSE 6751	Physical Chemistry of Polymer Solutions	3
MSE 6752	Polymer Characterization	4
MSE 6768	Polymer Structure, Physical Properties, and Characterization	3
MSE 6796	Structure-Property Relationships in Materials	3
MSE 7772	Fundamentals of Fracture Mechanics	3
PTFE 6100	Mechanics of Fibrous Materials	3
PTFE 6751	Physical Chemistry of Polymer Solutions	3
PTFE 6768	Polymer Structure, Physical Properties, and Characterization	3
PTFE 6796	Structure-Property Relationships in Materials	3

Code	Title	Credit Hours
Biological Sciences		
APPH 6211	Systems Physiology I: Cellular Mechanisms of Plasticity	3
APPH 6212	Systems Physiology II: Physiology of Neuromotor Tissues	3
APPH 6231	Biomechanical Aspects of Human Motor Control	3
APPH 6232	Locomotion Neuromechanics	3
APPH 6600	Muscle Structure and Plasticity	3
APPH 6213	Systems Physiology III: Integrated Systems and Adaptation	3
BIOL 6418	Microbial Physiology	3
BIOL 6570	Immunology	4
BIOL 6600	Evolution	3
BIOL 6626	Physiological Ecology	3
BIOL 6756	Discovery of Signaling Molecules	3
BIOL 7001	Foundations in Molecular and Cell Biology	4
BIOL 7668	Eukaryotic Molecular Genetics	3
BMED 4752	Introductory Neuroscience	3
BMED 6031	Principles of Basic Biomedical and Biological Sciences I	6
BMED 6032	Principles of Basis Biomedical and Biological Sciences II	6

BMED 6042	Systems Physiology	3
BMED 6793	Systems Pathophysiology	3
CHEM 6183	Organometallic Chemistry	3
CHEM 6373	Organic Synthesis	3
CHEM 6501	Biochemistry I	3
CHEM 6502	Biochemistry II	3
CHEM 6571	Enzymology and Metabolism	3
CHEM 6572	Macromolecular Structure	3
CHEM 6573	Molecular Biochemistry	3
CHEM 6582	Biophysical Chemistry	3
ME 6793	Systems Pathophysiology	3
Emory courses:		
IBS 506	Basics of Neurological Diseases	
IBS 518	Human Embryology	
IBS 519	Foundations in Developmental Biology	
IBS 524	Cancer Biology	
IBS 526	Cellular and Developmental Neuroscience	
IBS 527	Cell Biology and Histology	
IBS 531	Principles of Pharmacology	
IBS 536	Drug Metabolism and Toxicology	
IBS 542	Concepts of Immunology	
IBS 548	Biology of the Eye	
IBS 600	Blood and Water	
IBS 761	Cancer Pharmacology	

Code	Title	Credit Hours
Engineering Mathematics		
MATH 6267	Multivariate Statistical Analysis	3
CHBE 6500	Mathematical Modeling and Analysis of Chemical Processes	3
ECE 6601	Random Processes	3
MATH 6646	Numerical Methods for Ordinary Differential Equations	3
MATH 6701	Math Methods of Applied Sciences I	3
PHYS 6268	Nonlinear Dynamics and Chaos	3
ECE 8843	Special Topics (Foundations of Machine Learning)	3

Code	Title	Credit Hours
Technical Electives		
AE 6230	Structural Dynamics	3
APPH 6202	Clinical Gait Analysis	3
APPH 6225	Biostatistics	3
BIOL 7015	Cancer Biology and Technology	3
BIOL 7023	Bioinformatics	3
BMED 4750	Diagnostic Imaging Physics	3
BMED 4783	Introduction to Medical Image Processing	3
BMED 4784	Engineering Electrophysiology	3
BMED 6517	Machine Learning in Biosciences	3
BMED 6700	Biostatistics	3
BMED 6710	Rational Design of Biomaterials	3
BMED 6720	Biotransport	3
BMED 6739	Medical Robotics	3
BMED 6743	Tissue Mechanics	3
BMED 6774	Biomaterials: Structure and Function	3
BMED 6780	Medical Image Processing	3
BMED 6782	Cellular Engineering	3
BMED 6784	Cardiovascular Biomechanics	3
BMED 6786	Medical Imaging Systems	3
BMED 6787	Quantitative Electrophysiology	3
BMED 6794	Tissue Engineering	3
BMED 7201	Advanced Seminar: Cardiovascular Biology & Biomechanics	3
BMED 7413	Biochemical Systems Analysis	3
BMED 7610	Quantitative Neuroscience	3
CEE 6345	Sustainable Engineering	3
CHBE 6710	Microfluidics & Appl	3
CHBE 6752	Polymer Characterization	4
CHBE 6765	Drug Design, Development and Delivery	3
CHBE 6777	Advanced Biomaterials	3
CHBE 6782	Cellular Engineering	3
CHBE 6794	Tissue Engineering	3
CHBE 8803	Special Topics (Biosurfaces)	3
CHEM 6750	Preparation and Reaction of Polymers	3
CS 7643	Deep Learning	3
ECE 4781	Biomedical Instrumentation	3
ECE 4782	Biosystems Analysis	3
ECE 4783	Introduction to Medical Image Processing	3
ECE 4784	Engineering Electrophysiology	3
ECE 6200	Biomedical Applications of Microelectromechanical Systems	3
ECE 6780	Medical Image Processing	3
ECE 6786	Medical Imaging Systems	3
ECE 6787	Quantitative Electrophysiology	3
ISYE 6413	Design and Analysis of Experiments	3
ISYE 6414	Statistical Modeling and Regression Analysis	3
ISYE 7406	Data Mining and Statistical Learning	3
ME 6743	Tissue Mechanics	3
ME 6746	Rehabilitation Engineering	3
ME 6777	Advanced Biomaterials	3
ME 6782	Cellular Engineering	3
ME 6794	Tissue Engineering	3
MP/NRE 4750	Diagnostic Imaging Physics	3
MSE 6600	Advanced Polymer Processing	3
MSE 6752	Polymer Characterization	4
MSE 6777	Advanced Biomaterials	3
PHYS 6268	Nonlinear Dynamics and Chaos	3
PTFE 6750	Preparation and Reactions of Polymers	3
Emory course:		
IBS 534	Computational Neuroscience	

Master of Science in Bioinformatics

This is a three-semester, focused professional master's degree program combining 36 credit hours of courses in computer science, advanced molecular biology and biochemistry, statistics, and bioinformatics. A full-time summer internship in a corporate or academic bioinformatics group is an essential part of the curriculum. With input and assistance from corporate partners, the program is geared to training and placing graduates into lucrative jobs in the high-demand specialty field of bioinformatics. More information is available from the graduate coordinator of the M.S. Bioinformatics program.

Bioinformatics Website

Code	Title	Credit Hours
Core Coures [1]		
BIOL 6150	Genomics and Applied Bioinformatics	3
BIOL 7200	Programming for Bioinformatics	3
BIOL 7210	Computational Genomics	3
CS 4400	Introduction to Database Systems	3
CX 4803	Special Topics in Computational Science and Engineering (Machine Learning in Computational Biology)	3
Statistics Requirement		3
BIOS 4401	Experimental Design and Statistical Methods in Biological Sciences	
MATH 3215	Introduction to Probability and Statistics	
Capstone		3
BIOL 8530	Human Evolutionary Genomics	
BIOL 8803	Special Topics (Applied Human Computational Genomics)	
BIOL 8902	Special Problems [3]	
CEE 6720	Environmental Microbial Genomics	
CSE 6242	Data and Visual Analytics	
Bioinformatics Electives [2]		**15**
Total Credit Hours		**36**

1. Substitution for any of the courses must be approved by program director
2. Students may choose from a wide range of graduate courses in Biology, Biomedical Engineering, Computer Sciences, Computational Sciences and Engineering, Chemistry, Industrial and Systems Engineering, and Mathematics. For a full list of recommended electives, please see: https://bioinformatics.gatech.edu/recommended-courses.
3. 3rd semester of research in same lab, totaling 9 or more credit hours

Master of Science in Biomedical Engineering

This master's degree allows students to pursue advanced studies in biomedical engineering in the following areas: biomedical imaging and instrumentation, biomaterials and regenerative technologies, cellular engineering and mechanics, biomedical informatics and systems modeling, neuroengineering, and biomedical robotics.

The master's degree program requires 30 credit hours beyond the bachelor's degree. Both thesis and non-thesis options are available. Courses are offered all three terms; however, full-time students planning to complete the MS degree in 12 months should start their programs in the fall semester.

Thesis Option for Master of Science in Biomedical Engineering

Students must maintain a minimum GPA of 3.0 in their program coursework. If a student's GPA drops below the required 3.0, they will be given two consecutive semesters to regain the minimum required GPA. Failure to do so will result in the student's dismissal from the MSBMED program.

21 hours of coursework plus 9 hours of Thesis

Code	Title	Credit Hours
Courses [1]		**21**
Bioscience Courses		At least 3 hours
Engineering Courses		At least 3 hours
Data Science		At least 3 hours
Approved Electives		At least 6 hours
Thesis Hours [2]		**9**
BMED 7000	Master's Thesis	
Total Credit Hours for Thesis Option		**30**

1. The overall balance of bioscience, data science, and engineering courses is determined by the student and the academic advisor and should factor the student's prior knowledge, professional objectives and research interests if the thesis option is pursued. Courses must be documented on the Program of Study form and must be approved by the Graduate Program Committee.
2. Students pursuing the Thesis Option must secure a thesis advisor. If a student is not able to do so, then the student will need to pursue the non-thesis option.

Non-Thesis Option for Master of Science in Biomedical Engineering

30 hours of coursework

Code	Title	Credit Hours
Courses [1]		**30**
Bioscience Courses		At least 3 hours
Engineering Courses		At least 3 hours
Data Science		At least 3 hours
Approved Electives		At least 9 hours
Total Credit Hours for Non-Thesis Option		**30**

1. The overall balance of bioscience, data science, and engineering courses is determined by the student and the academic and thesis advisor and should factor the student's prior knowledge, professional objectives and research interests if the non-thesis option is pursued.

Courses must be documented on the Program of Study form and must be approved by the Graduate Program Committee.

BS/MS Option

Students completing both a bachelor's and master's in biomedical engineering at Georgia Tech may use up to six credit hours of graduate-level coursework in the major discipline for both degrees. Students still must complete all other course requirements for both degrees.

Once admitted, a GPA of at least 3.0 must be maintained to remain in the program.

Up to six credit hours of engineering and data science courses from the approved lists for the MS BMED Program may be shared as depth electives with the BS BMED Program

Master of Science in Biology

The School of Biological Sciences offers two distinct programs leading to the M.S. in Biology degree. The M.S. in Biology (non-thesis) is intended for students who plan to pursue advanced training in one aspect of modern biology. The M.S. in Biology (with thesis) is intended for students wishing to obtain a strong background in modern biology and independent research experience in preparation for a wide range of career options, or further training leading to the PhD in biology. Students admitted to the Masters degree program in the School of Biological Sciences are enrolled in a non-thesis program of study. If a student wishes to obtain a Masters degree with Thesis, they may petition the Graduate Committee for approval along with support from their thesis advisor.

Biology Graduate Programs Website

Non-Thesis Option

Code	Title	Credit Hours
Biology graduate courses (6000-9000-level) [1]		15
Other graduate courses (6000-9000-level; may be outside of BIOL) [1]		9
Other Biology courses (4000-level or higher) [1]		6
BIOL 8901	Special Problems	4
BIOL 8002 & BIOL 8003	Seminar and Seminar	2
Total Credit Hours		**36**

[1] Must be letter grade

Thesis Option

Code	Title	Credit Hours
Biology graduate courses (6000-9000-level) [1]		12
BIOL 7000	Master's Thesis	9
Other Biology courses (4000-level or higher) [1]		6
BIOL 8901	Special Problems	7
BIOL 8002 & BIOL 8003	Seminar and Seminar	2
Total Credit Hours		**36**

[1] Must be letter grade

Master of Biomedical Innovation and Development

MBID (Biomedical Innovation & Development) Master's program at Georgia Tech, Atlanta, GA, provides the specialized training, exposure and skill sets required for the rigors of product development of high quality medical devices and for training potential future leaders of the medical device industry to promote innovation, entrepreneurship, commercialization and creation of medical device based economies across global settings. The program, since inception in 2013, has grown to be a signature Professional Master's program at Georgia Tech and gained recognition nationally (in USA) across both academia and industry.

The program brings together students from a diverse array of educational and professional backgrounds (e.g., engineering, sciences, medicine, nursing, etc.) to learn and work in multi-disciplinary teams on clinically relevant needs for new techniques and products for the medical industry. The faculty, composed of medical device industry leaders, practicing clinicians and GT management professors, have created an industry relevant, real world based multi-disciplinary curriculum and teaching approach to educate graduate students from diverse backgrounds. A total of 176 students have graduated from this program to date (2013-20). The program accepts applicants only for Fall semester.

The program graduates have been successfully placed in various roles within the medical device industry functions (such as R&D, Quality, Manufacturing, Marketing, Regulatory, Clinical, Business Development, Project Management, etc.). Graduates have been employed by start-ups as well as device industry leaders such as Medtronic, J&J, Abbott, Intuitive Surgical, Cook Medical, Boston Scientific and Stryker in USA and abroad. A three minute video clipping giving overview of program objectives: http://mbid.bme.gatech.edu/content/video-overview

Further details on the program can be found on the program web site at: http://mbid.bme.gatech.edu/

For further information, please contact the MBID Program Director: Prof. Sathya Gourisankar, sathya@bme.gatech.edu, Tel: 4043851230.

Code	Title	Credit Hours
BMED 6501	Fundamentals of Biomedical Innovation and Development Processes	3
BMED 6502	BioID Clinical Literacy and Experience	3
BMED 6503	Medical Markets and Clinical Specialties	3
BMED 6504	Financial Planning for Development Projects	3
BMED 6505	Product Planning and Project Management	3
BMED 6506	Professional Communications for Biomedical Innovation and Development	3
BMED 6507	Medical Device Regulatory Requirements	3
BMED 6508	BioID Team Masters Project I	3
BMED 6509	BioID Masters Project II	6
Graduate Electives [1]		6
Total Credit Hours		**36**

[1] Graduate electives must be taken during Spring semester due to timing of other program requirements. Electives may be any 6000-level or higher courses.

Master of Science in Building Construction and Facility Management

The master's degree program in the School of Building Construction focuses on management-based education for industry professionals seeking executive leadership positions in the industry. Our graduate training offers a holistic approach to business processes, integrating coursework, seminars, and hands-on learning to equip today's industry professionals with the resources they need to excel in their professional careers. The graduate program consists of two concentrations:

1. Program and Facility Management
2. Technology

Students can complete either a thesis or non-thesis option for the degree.

Students in the program come from a variety of backgrounds, often with experience in facility management, construction, architecture, engineering, city planning, management, or business. The program is tailored to meet the needs of professionals by offering evening classes, giving students the flexibility of continuing to work while taking courses.

Thesis Option

Code	Title	Credit Hours
Core Courses		
BC 6650	Advanced Project Management	3
BC 6550	Design and Construction Processes for Integrated Services	3
BC 6250	Value Management for Integrated Facility Design and Construction	3
BC 6300	Safety and Environmental Issues	3
BC 6685	Leadership and Communications in Design and Construction	3
Approved Electives [1]		6
BC 7100	Quantitative Methods for Construction Research	3
Master's Thesis		6
Total Credit Hours		**30**

[1] Thesis students should not declare a concentration. Approved electives may be taken from Approved Elective list or from the concentration lists.

Non-Thesis Option

Code	Title	Credit Hours
Core Courses		
BC 6650	Advanced Project Management	3
BC 6550	Design and Construction Processes for Integrated Services	3
BC 6250	Value Management for Integrated Facility Design and Construction	3
BC 6300	Safety and Environmental Issues	3
BC 6685	Leadership and Communications in Design and Construction	3
Concentration Courses [1]		12
Approved Electives [2]		3
Total Credit Hours		**30**

[1] See concentration lists below.
[2] See Approved Electives list below.

Code	Title	Credit Hours
Program and Facility Management Concentration		
BC 6185	Introduction to Construction Program Management	3
BC 6485	Management of Preconstruction Phase as Owner	3
BC 6200	Maintenance Management of Built Assets	3
BC 6100	Professional Trends in Facility Management	3

Code	Title	Credit Hours
Technology Concentration		
BC 6050	Building Information Modeling for Multi-disciplinary Integration	3
BC 6005	Technology Applications in the Construction Industry	3
BC 8803	Special Topics (Digital Twins for the Built Environment)	3
BC 8803	Special Topics (Construction 4.0)	3

Code	Title	Credit Hours
Approved Electives		
BC 6675	Residential Design and Construction	3
BC 6370	Real Estate Policy, Trends, Ethics	3
BC 6600	Facilities Management Financial Analysis	3
BC 6475	Real Estate Development Law	3
BC 6350	Design and Construction Law	3
BC 6270	Community Design and Development	3
BC 6975	The Evolution of a Deal	3
BC 7100	Quantitative Methods for Construction Research	3
CEE 6140	Advanced Planning and Estimating Methods	3
CEE 8813	Special Topics (Construction Industry Best Practices)	3

Master of Business Administration (MBA)

Georgia Tech's Scheller College of Business offers the MBA for the 21st century, building business leaders who are innovative, entrepreneurially-minded, analytically-skilled, and can leverage technology in a global setting. Highly qualified candidates from all academic and professional backgrounds enter the program, which is designed to foster teamwork, diversity, and a closely knit network.

The MBA program is offered in full-time, evening, and weekend executive formats. For the full-time and weekend executive MBA programs, entry is in the fall semester only. For the evening program, admission is offered in both fall and spring semesters. Some of the primary advantages of the MBA program include a close community that promotes enriched student-faculty relationships; classmates with diverse educational and work experiences; small class sizes that foster networking and a true understanding of the business environment; an innovative curriculum that keeps pace with the rapidly changing environment of business and technology. Scheller College's location within the Tech Square innovation ecosystem, a globally recognized nexus of innovation and entrepreneurial activity in the heart of Midtown Atlanta, provides MBA students access to some of the most dynamic companies and startups. In addition, a dual degree option gives students the opportunity to combine the MBA with Georgia Tech engineering, computing and design masters and Ph.D. programs.

During the summer term between the first and second academic years, full-time MBA students intern with companies ranging from Fortune 500 Companies and major consulting/finance firms to entrepreneurial ventures, innovation centers, and start-ups. These summer internships enhance permanent employment opportunities.

The full-time and evening MBA programs requires 54 hours; 21 semester hours are core classes. Core courses develop a common body of knowledge essential to all MBA students. The remainder of the curriculum consists of electives, which provide flexibility for students to build competence in one or more immersive tracks and concentration areas. This freedom permits students to customize a curriculum directed toward their own educational and career goals.

MBA elective areas include accounting, entrepreneurship, finance, business analytics, leadership, information technology management, law, international business, marketing, operations management, organizational behavior, sustainability, real estate strategic management, and leading innovation.

More information, applications, and viewbooks may be found at: http://scheller.gatech.edu/MBA.

Scheller College of Business
MBA Program Office
Georgia Institute of Technology
Atlanta, Georgia 30308-0520
phone: 404.894.8722

- Request a Full-Time MBA Viewbook
- Request an Evening MBA Viewbook
- Request an Executive MBA Viewbook

Code	Title	Credit Hours
Core		
MGT 6000	Financial and Managerial Accounting I (LG)	3
MGT 6504	Principles of Finance (LG)	1.5
MGT 6502	Leading People and Organizations (LG)	1.5
MGT 6503	Managing Information Resources (LG)	1.5
MGT 6509	Legal and Ethical Considerations in Business (LG)	1.5
MGT 6508	Strategic Management (LG)	3
MGT 6507	Business Communications (PF)	1.5
MGT 6506	Managerial Economics (LG)	1.5
MGT 6505	Marketing Management (LG)	1.5
MGT 6501	Operations Management (LG)	1.5
MGT 6500	Analytical Tools for Decisions (LG)	1.5
MGT 6510	Leadership Development Workshop (LG)	1.5
Electives		
International Graduate Management Elective (LG) [2]		3
Graduate Management Elective (LG)		27
Graduate Management Elective (PF)		3
Total Credit Hours		**54**

[1] Students will complete 12 hours of concentration requirements. See concentration options listed below.

[2] Courses that will satisfy International Elective: MGT 6030, MGT 6056, MGT 6070, MGT 6071, MGT 6116, MGT 6118, MGT 6185, MGT 6197, MGT 6335, MGT 6352, MGT 6360, MGT 6401, MGT 6802, MGT 6803

Concentration Areas and Course Options

Code	Title	Credit Hours
Accounting		
MGT 6010	Individual Taxation: Analysis and Planning	3
MGT 6015	Managerial Accounting II	3
MGT 6020	Financial Reporting and Analysis I	3
MGT 6022	Financial Reporting and Analysis II	3
MGT 6028	Financial Analysis and Reporting of Technology Firms	3
MGT 6030	International Accounting	3
MGT 6042	Auditing and Financial Control Systems	3
MGT 6043	Advanced Financial Reporting	3
MGT 6046	Applications of Data Analytics in Accounting	3
MGT 6076	Valuing Technology Firms	3
MGT 6400	Pricing Analytics and Revenue Management	3

Code	Title	Credit Hours
Business Analytics		
MGT 6046	Applications of Data Analytics in Accounting	3
MGT 6051	Database Development and Applications	3
MGT 6056	Electronic Commerce-Conducting Business on the Internet	3
MGT 6057	Business Process Analysis and Design	3
MGT 6203	Data Analytics in Business	3
MGT 6213	Business Analytics for Managers	3
MGT 6214	Business Analytics Practicum	3
MGT 6310	Marketing Research: Qualitative Aspects	3
MGT 6314	Understanding Markets with Data Science	3
MGT 6315	Marketing Analysis	3
MGT 6400	Pricing Analytics and Revenue Management	3
MGT 6401	Supply Chain Modeling	3
MGT 6450	Project Management	3
MGT 6451	Business Intelligence and Analytics	3
MGT 6452	Machine Learning for Business	3

MGT 6655	Business Data Preparation and Visualization	3
MGT 6725	Information Security Strategies and Policies	3
MGT 6726	Privacy, Technology, Policy, and Law	3

Code	Title	Credit Hours
Entrepreneurship		
MGT 6056	Electronic Commerce-Conducting Business on the Internet	3
MGT 6059	Emerging Technologies	3
MGT 6086	Entrepreneurial Finance and Private Equity	3
MGT 6165	Venture Creation	3
MGT 6663	Technology Strategy	3
MGT 6664	Managing Innovation	3
MGT 6667	Strategic Entrepreneurship	3
MGT 6772	Managing Resources of the Technological Firm	3
MGT 6789	Technology Ventures	3

Code	Title	Credit Hours
Finance		
MGT 6066	Mergers and Acquisitions	3
MGT 6067	Financial Aspects of Commercial Real Estate	3
MGT 6070	International Finance	3
MGT 6074	Fintech & Cryptocurrencies	3
MGT 6076	Valuing Technology Firms	3
MGT 6078	Basic Finance and Investments	3
MGT 6080	Investments	3
MGT 6081	Derivative Securities	3
MGT 6086	Entrepreneurial Finance and Private Equity	3
MGT 6090	Management of Financial Institutions	3
MGT 6769	Fixed Income Securities	3
MGT 6785	The Practice of Quantitative and Computational Finance	3
MGT 6793	Advanced Topics in Quantitative and Computational Finance	3

Code	Title	Credit Hours
International Business		
MGT 6030	International Accounting	3
MGT 6070	International Finance	3
MGT 6116	The Role of Gender, Race and Ethnicity in Organizational Behavior	3
MGT 6118	Cross-Cultural Management	3
MGT 6185	International Business Environments	3
MGT 6197	Global Strategic Management	3
MGT 6352	International Practicum	3
MGT 6360	Global Operations and Supply Chain Management	3

Code	Title	Credit Hours
Leadership		
MGT 6107	Leadership and Organizational Change	3
MGT 6110	Negotiation and Conflict Resolution	3
MGT 6113	ProBono Non-Profit Consulting Projects	3
MGT 6114	Leadership Development	3
MGT 6116	The Role of Gender, Race and Ethnicity in Organizational Behavior	3
MGT 6118	Cross-Cultural Management	3
MGT 6119	Leading Teams in Organizations	3

Code	Title	Credit Hours
Management		
MGT 6010	Individual Taxation: Analysis and Planning	3
MGT 6015	Managerial Accounting II	3
MGT 6020	Financial Reporting and Analysis I	3
MGT 6022	Financial Reporting and Analysis II	3
MGT 6028	Financial Analysis and Reporting of Technology Firms	3
MGT 6030	International Accounting	3
MGT 6042	Auditing and Financial Control Systems	3
MGT 6043	Advanced Financial Reporting	3
MGT 6051	Database Development and Applications	3
MGT 6056	Electronic Commerce-Conducting Business on the Internet	3
MGT 6057	Business Process Analysis and Design	3
MGT 6070	International Finance	3
MGT 6074	Fintech & Cryptocurrencies	3
MGT 6076	Valuing Technology Firms	3
MGT 6078	Basic Finance and Investments	3
MGT 6080	Investments	3
MGT 6081	Derivative Securities	3
MGT 6086	Entrepreneurial Finance and Private Equity	3
MGT 6090	Management of Financial Institutions	3
MGT 6107	Leadership and Organizational Change	3
MGT 6110	Negotiation and Conflict Resolution	3
MGT 6113	ProBono Non-Profit Consulting Projects	3
MGT 6114	Leadership Development	3
MGT 6116	The Role of Gender, Race and Ethnicity in Organizational Behavior	3
MGT 6118	Cross-Cultural Management	3
MGT 6119	Leading Teams in Organizations	3
MGT 6164	Corporate Strategy	3
MGT 6165	Venture Creation	3
MGT 6185	International Business Environments	3
MGT 6190	Current Thinking In Strategy	3
MGT 6197	Global Strategic Management	3
MGT 6203	Data Analytics in Business	3
MGT 6213	Business Analytics for Managers	3
MGT 6214	Business Analytics Practicum	3
MGT 6302	Consumer Behavior	3
MGT 6308	Strategic Brand Management	3
MGT 6310	Marketing Research: Qualitative Aspects	3
MGT 6311	Digital Marketing	3
MGT 6314	Understanding Markets with Data Science	3

MGT 6046	Applications of Data Analytics in Accounting	3
MGT 6312	Marketing Research: Tools and Design	3
MGT 6315	Marketing Analysis	3
MGT 6325	Product Planning	3
MGT 6326	Collaborative Product Development	3
MGT 6345	Marketing Practicum	3
MGT 6452	Machine Learning for Business	3
MGT 6352	International Practicum	3
MGT 6353	Operations Strategy	3
MGT 6357	Service Operations Management	3
MGT 6359	Business Strategies For Sustainability	3
MGT 6360	Global Operations and Supply Chain Management	3
MGT 6369	Sustainable Business Practicum	3
MGT 6400	Pricing Analytics and Revenue Management	3
MGT 6401	Supply Chain Modeling	3
MGT 6405	Lean Six Sigma	3
MGT 6450	Project Management	3
MGT 6451	Business Intelligence and Analytics	3
MGT 6655	Business Data Preparation and Visualization	3
MGT 6663	Technology Strategy	3
MGT 6664	Managing Innovation	3
MGT 6665	Strategy Execution	3
MGT 6667	Strategic Entrepreneurship	3
MGT 6668	Behavioral Economics	3
MGT 6725	Information Security Strategies and Policies	3
MGT 6726	Privacy, Technology, Policy, and Law	3
MGT 6727	Privacy for Professionals	3
MGT 6769	Fixed Income Securities	3
MGT 6772	Managing Resources of the Technological Firm	3
MGT 6789	Technology Ventures	3
MGT 6801	TI:GER Innovation Analysis	3
MGT 6802	TI:GER Innovation and Business Model Design	3
MGT 6803	TI:GER Innovation Execution	3
MGT 6821	TI:GER Innovation Research Methods 1	1.5
MGT 6822	TI:GER Innovation Research Methods 2	1.5

Code	Title	Credit Hours
Management of Information Resources		
MGT 6042	Auditing and Financial Control Systems	3
MGT 6051	Database Development and Applications	3
MGT 6056	Electronic Commerce-Conducting Business on the Internet	3
MGT 6057	Business Process Analysis and Design	3
MGT 6058	Information Technology Practicum	3
MGT 6059	Emerging Technologies	3
MGT 6203	Data Analytics in Business	3
MGT 6213	Business Analytics for Managers	3
MGT 6450	Project Management	3
MGT 6451	Business Intelligence and Analytics	3
MGT 6452	Machine Learning for Business	3
MGT 6655	Business Data Preparation and Visualization	3
MGT 6725	Information Security Strategies and Policies	3
MGT 6726	Privacy, Technology, Policy, and Law	3
MGT 6772	Managing Resources of the Technological Firm	3

Code	Title	Credit Hours
Marketing		
MGT 6302	Consumer Behavior	3
MGT 6308	Strategic Brand Management	3
MGT 6310	Marketing Research: Qualitative Aspects	3
MGT 6311	Digital Marketing	3
MGT 6312	Marketing Research: Tools and Design	3
MGT 6314	Understanding Markets with Data Science	3
MGT 6325	Product Planning	3
MGT 6326	Collaborative Product Development	3
MGT 6345	Marketing Practicum	3
MGT 6400	Pricing Analytics and Revenue Management	3

Code	Title	Credit Hours
Supply Chain and Operations Management		
MGT 6326	Collaborative Product Development	3
MGT 6353	Operations Strategy	3
MGT 6357	Service Operations Management	3
MGT 6359	Business Strategies For Sustainability	3
MGT 6360	Global Operations and Supply Chain Management	3
MGT 6400	Pricing Analytics and Revenue Management	3
MGT 6401	Supply Chain Modeling	3
MGT 6405	Lean Six Sigma	3
MGT 6772	Managing Resources of the Technological Firm	3

Code	Title	Credit Hours
Product and Service Innovation		
MGT 6056	Electronic Commerce-Conducting Business on the Internet	3
MGT 6057	Business Process Analysis and Design	3
MGT 6059	Emerging Technologies	3
MGT 6074	Fintech & Cryptocurrencies	3
MGT 6119	Leading Teams in Organizations	3
MGT 6165	Venture Creation	3
MGT 6311	Digital Marketing	3
MGT 6325	Product Planning	3
MGT 6326	Collaborative Product Development	3
MGT 6357	Service Operations Management	3
MGT 6663	Technology Strategy	3
MGT 6664	Managing Innovation	3
MGT 6789	Technology Ventures	3

Code	Title	Credit Hours
Strategy and Innovation		
MGT 6113	ProBono Non-Profit Consulting Projects	3
MGT 6164	Corporate Strategy	3

MGT 6165	Venture Creation	3
MGT 6185	International Business Environments	3
MGT 6190	Current Thinking In Strategy	3
MGT 6197	Global Strategic Management	3
MGT 6369	Sustainable Business Practicum	3
MGT 6663	Technology Strategy	3
MGT 6664	Managing Innovation	3
MGT 6665	Strategy Execution	3
MGT 6667	Strategic Entrepreneurship	3
MGT 6668	Behavioral Economics	3
MGT 6789	Technology Ventures	3
MGT 6801	TI:GER Innovation Analysis	3

Code	Title	Credit Hours
Sustainability		
MGT 6059	Emerging Technologies	3
MGT 6113	ProBono Non-Profit Consulting Projects	3
MGT 6326	Collaborative Product Development	3
MGT 6357	Service Operations Management	3
MGT 6359	Business Strategies For Sustainability	3
MGT 6401	Supply Chain Modeling	3
MGT 6663	Technology Strategy	3
MGT 6667	Strategic Entrepreneurship	3
MGT 6772	Managing Resources of the Technological Firm	3

Code	Title	Credit Hours
Technological Innovation: Generating Economic Results (TI:GER)		
MGT 6801	TI:GER Innovation Analysis	3
MGT 6802	TI:GER Innovation and Business Model Design	3
MGT 6803	TI:GER Innovation Execution	3
MGT 6821	TI:GER Innovation Research Methods 1	1.5
MGT 6822	TI:GER Innovation Research Methods 2	1.5
MGT 6663	Technology Strategy	3

Master of Business Administration - Global Business

As the business world becomes increasingly global, executives must understand and actively manage its impact on current business operations and future business trends. Georgia Tech's MBA - Global Business (Global Executive MBA) program trains executives to take leadership positions in businesses that have global aspirations. Whether you want to work overseas or grow your company at home, understanding how global issues are increasingly affecting every type of business is essential. The MBA - Global Business program will prepare you to effectively lead your business in a global environment of increasing complexity and technological sophistication.

Rigorous Curriculum

The MBA - Global Business program enhances traditional MBA coursework to include international perspectives on finance, operations, economics, technology, and marketing. The core MBA curriculum is supplemented with coursework on global markets, global trade, global supply chain, and global organizations. The curriculum takes advantage of Georgia Tech's unique academic strengths and international presence.

International Business Experience

Designed to be a truly international experience, the MBA - Global Business program includes two trips overseas to gain firsthand knowledge of key issues in international commerce. These destinations vary from year to year, but focus on regions of emerging importance such as China, India, Latin America, and Eastern Europe. Through lectures and company visits, these international trips examine the cultural, social, and economic aspects of each location. A year-long global strategy capstone project ties together the international residencies and classroom learning to provide an integrative experience across all aspects of the curriculum.

Who Should Apply

Qualified candidates for the MBA-Global Business program have ten to fifteen years of professional experience (a minimum of five years is required), during which they have demonstrated increased responsibility, professional growth, and leadership.

These candidates are highly motivated to develop the business skills that are critical for leaders in a global setting. Industry background, company size, and titles of participants vary, allowing students to gain a broad understanding of global issues and scenarios.

Admission

Applications are reviewed and accepted throughout the year. Priority will be given to applications received prior to April 1. After that date, applications received will be reviewed on a space-available basis. Taking the GMAT may be required based on a review of your application portfolio. For additional information on admission requirements, please contact us at GlobalEMBA@gatech.edu.

Contact information

MBA - Global Business
Georgia Tech College of Business
800 West Peachtree Street
Suite 310
Atlanta, GA 30308
Phone: 404.385.2254
Fax: 404.894.1464
MBA – Global Business Website

Program of Study

The MBA - Global Business degree is a specialized MBA degree requiring fifty semester credit hours of study. It consists of a fixed sequence of courses over a seventeen-month period with a new class beginning each fall semester and graduating at the end of the following fall semester. Classes are held on select weekends (Friday evening and all day Saturday), allowing participants to minimize time away from their jobs. In addition, there are four residencies, including two week long sessions at Georgia Tech and two trips abroad. To graduate, students must earn a cumulative grade point average of at least 2.7. To remain on good standing during the program, students must earn the minimum satisfactory cumulative grade point average of 2.7. Any student receiving three or more grades of U, D, or F, in any combination, may be dismissed from the program.

Code	Title	Credit Hours
Core Courses		
IMBA 6010	Cross-cultural Communications for Management	2
IMBA 6021	Data Analysis for Business	2
IMBA 6031	Leadership and Organizational Behavior	2
IMBA 6040	Economic Analysis of Decisions in a Global Economy	3
IMBA 6050	Financial and Managerial Accounting	3
IMBA 6061	Information Systems for Global Organizations	2
IMBA 6071	Financial Management	3
IMBA 6081	Manufacturing and Service Management	2
IMBA 6090	Marketing and Consumer Behavior	3
IMBA 6131	Strategic Management Theory and Analysis	2
IMBA 6160	National and International Regulation of Business	2
IMBA 6230	International Business Negotiations	1
MOT 6133	Ethical Decision Making	1
Specialization Courses		
IMBA 6101	Product Strategies for Global Markets	2
IMBA 6121	Managing the Global Workforce	2
IMBA 6140	Comparative Management Systems	2
IMBA 6250	International Finance	2
IMBA 6260	Global Supply Chain and Electronic Commerce	2
IMBA 6430	Business Strategies for Sustainability	2
International Residency		
IMBA 6311	Analysis of Global Environments	4
IMBA 6401	Global Strategy Project I	2
Capstone Project		
IMBA 6411	Global Strategy Project II	2
IMBA 6420	Global Strategy Project II	2
Total Credit Hours		**50**

Master of Business Administration in Management of Technology

As technology alters the business landscape at an unprecedented pace, the Master of Business Administration – Management of Technology (Executive MBA in Management of Technology or EMBA-MOT) program will help you stay ahead of the curve and the competition. Leverage your technology background for competitive advantage as you learn to cope with the challenges presented by rapid innovation, shorter product life cycles, and emerging technologies.

No one understands innovation and technical experts like Georgia Tech, and the professors in our top-ranked business school know how to enhance your technical knowledge and increase your business savvy. In addition to gaining a foundation in business through MBA core courses, you will learn how to manage innovation and organizational change, conduct technology forecasting, and identify promising emerging technologies.

Through the EMBA-MOT program, you will gain the leadership and communication skills that are essential to maintain an upward trajectory in your career. The program will complement your technology background and help you leverage it for advancement. You will learn not only to speak the language of business fluently, but also to think and plan strategically. You will gain the confidence to communicate with senior leadership and manage teams of technical professionals at home and abroad. As more and more technical jobs are outsourced to employees in newly industrialized countries such as China and India, the role of the technical professional in the U.S. is rapidly changing. You may find that your role is shifting from performing technical duties to managing an international workforce or multiple vendors. The EMBA-MOT program will equip you to handle these new challenges while improving the performance of your company.

At the conclusion of the seventeen-month program, you will go on an international study tour of China, which includes visits to global research and development centers and meetings with executives from top companies. The trip also includes cultural excursions and networking events with local executives to complement your international learning experience.

Who Should Apply

Candidates should have a minimum of five years of professional work experience, a baccalaureate degree from an accredited institution, and a record of positive career growth and achievements through positions of increasing responsibility. The Executive MBA in Management of Technology program is particularly well-suited for technical professionals as well as for professionals working in companies strongly impacted by technology and/or increasing demands for innovative new products and services.

Admission

Applications are reviewed and accepted throughout the year. Priority will be given to applications received prior to April 1. After that date, applications will be reviewed on a space-available basis. Taking the GMAT may be required based on a review of your application portfolio. For additional information on admission requirements, please contact us at emba-mot@gatech.edu.

Contact Information

MBA – Management of Technology
Georgia Tech College of Business
800 West Peachtree St. NW
Atlanta, GA 30308-0520
Phone: 404.385.2254
Fax: 404.894.1464
MBA – Management of Technology Website

Program of Study

The MBA - Management of Technology degree is a specialized MBA degree requiring fifty semester credit hours of study. It consists of a fixed sequence of courses over a seventeen-month period with a new class beginning each fall semester and graduating at the end of the following fall semester. Classes are held on select weekends (Friday evening and all day Saturday), allowing participants to minimize time away from their jobs. In addition, there are four residencies, including two week long sessions at Georgia Tech and two trips abroad. To graduate, students must earn a cumulative grade point average of at least 2.7. To remain on good standing during the program, students must earn the minimum satisfactory cumulative grade point average of 2.7. Any student receiving

three or more grades of U, D, or F, in any combination, may be dismissed from the program.

Code	Title	Credit Hours
Core Courses		
IMBA 6010	Cross-cultural Communications for Management	2
IMBA 6021	Data Analysis for Business	2
IMBA 6032	Leadership and Organizational Behavior	3
IMBA 6040	Economic Analysis of Decisions in a Global Economy	3
IMBA 6050	Financial and Managerial Accounting	3
IMBA 6061	Information Systems for Global Organizations	2
IMBA 6071	Financial Management	3
IMBA 6081	Manufacturing and Service Management	2
IMBA 6090	Marketing and Consumer Behavior	3
IMBA 6132	Strategy	3
IMBA 6160	National and International Regulation of Business	2
IMBA 6230	International Business Negotiations	1
MOT 6133	Ethical Decision Making	1
Electives		4
Specialization Courses		
MOT 6106	Processes of Technological Innovation	2
MOT 6111	Organizational Transformation Methods	2
MOT 6115	AI & Machine Learning for Business	2
MOT 6128	Venture Financing	2
IMBA 6430	Business Strategies for Sustainability	2
International Residency		
IMBA 6301	Analysis of Global Environments	2
Capstone Project		
MOT 6132	Management of Technology Project I	2
MOT 6134	Management of Technology Project II	2
Total Credit Hours		**50**

Master of Science in Chemical Engineering

The School of Chemical & Biomolecular Engineering offers the MS degree in Chemical Engineering. The MS degree has two options: coursework and thesis. Additional information about the School is available at https://www.chbe.gatech.edu/ or upon request by calling 404.894.1838.

MS students in Chemical Engineering must successfully complete the following courses (or their equivalents) with an average cumulative GPA of 2.7 or higher. All courses must be completed with a grade of A, B, or C.

Non-Thesis Option

Code	Title	Credit Hours
CHBE 6003	Chemical Process Safety	1
CHBE 6100	Advanced Chemical Engineering Thermodynamics	3
CHBE 6200	Advanced Transport Phenomena, Fluid Mechanics, and Heat	3
CHBE 6260	Transport Phenomena-Mass Transfer	3
CHBE 6300	Kinetics and Reactor Design	3
CHBE 6500	Mathematical Modeling and Analysis of Chemical Processes	3
CHBE Elective		3
Other Electives		12
Total Credit Hours		**31**

Thesis Option

Code	Title	Credit Hours
CHBE 6003	Chemical Process Safety	1
CHBE 6100	Advanced Chemical Engineering Thermodynamics	3
CHBE 6200	Advanced Transport Phenomena, Fluid Mechanics, and Heat	3
CHBE 6260	Transport Phenomena-Mass Transfer	3
CHBE 6300	Kinetics and Reactor Design	3
CHBE 6500	Mathematical Modeling and Analysis of Chemical Processes	3
CHBE Elective		3
Other Elective		3
CHBE 7000	Master's Thesis	9
Total Credit Hours		**31**

The MS thesis defense examination will be conducted by the Doctoral Examination Committee chosen by the student and the thesis advisor and approved by the Graduate Studies Committee and the Dean of Graduate Studies. The examination will be announced throughout the School and will be open to the academic community. The student will be required to make an oral presentation of the final thesis. If both the dissertation and examination are satisfactory, and there is compliance with all the requirements of the MS program, then the candidate will be certified as qualified to receive the Master's Degree.

Master of Science in Chemistry

The School of Chemistry of Biochemistry offer thesis and non-thesis programs of study leading to a Master of Science in Chemistry. The M.S. degree (non-thesis option) is a terminal degree. Course work spanning all the traditional areas of Chemistry and Biochemistry, as well as interdisciplinary topics, can be used towards these degrees. For the thesis based degree, original research in the traditional areas of Chemistry and Biochemistry, or variety of interdisciplinary topics, can be used as the basis for the thesis.

Chemistry Website

Thesis Option

Code	Title	Credit Hours
Area of Specialization [1,3]		**12**
Second Area of Specialization [1,3]		**6**
Approved Electives [2,3]		**4**
CHEM 8002	Information Resources for Chemists and Biochemists	2

CHEM 7000	Master's Thesis	6
Completion of a thesis describing original research		
Total Credit Hours		**30**

1 Course must be completed for letter-grade

2 Courses from any area of specialization, CETL 8000, CHEM 7001, CHEM 8000, CHEM 8001, CHEM 8003. Additionally, with approval from the director of graduate studies CHEM 8901, CHEM 8902, CHEM 8903 and other courses can be used. One hour maximum of Pass/Fail may be used.

3 Up to a total of 6 hours of 4000 level credit, at a grade of B or above, can be used toward this degree from the following list of courses: CHEM 4113, CHEM 4311, CHEM 4341, CHEM 4401, CHEM 4452, CHEM 4485, CHEM 4521, CHEM 4740, CHEM 4759, CHEM 4760, CHEM 4762, CHEM 4765, CHEM 4775, CHEM 4776, and CHEM 4785. CHEM 4000-level special topics courses will be considered on a case-by-case basis. CHEM 4000- and CHEM 6000-level courses, which are largely equivalent, can't both be counted.

Non-Thesis Option

Code	Title	Credit Hours
Area of Specialization [1,3]		**12**
Second Area of Specialization [1,3]		**6**
Course from any Area of Specialization [1,3]		**3**
Approved Electives [2,3]		**9**
Total Credit Hours		**30**

1 Course must be completed for letter-grade

2 Courses from any area of specialization, CETL 8000, CHEM 7001, CHEM 8000, CHEM 8001, CHEM 8002, CHEM 8003. Additionally, with approval from the director of graduate studies CHEM 8901, CHEM 8902, CHEM 8903 and other courses can be used. Three hours maximum of Pass/Fail may be used.

3 Up to a total of 6 hours of 4000 level credit, at a grade of B or above, can be used toward this degree from the following list of courses: CHEM 4113, CHEM 4311, CHEM 4341, CHEM 4401, CHEM 4452, CHEM 4485, CHEM 4521, CHEM 4740, CHEM 4759, CHEM 4760, CHEM 4762, CHEM 4765, CHEM 4775, CHEM 4776, and CHEM 4785. CHEM 4000-level special topics courses will be considered on a case-by-case basis. CHEM 4000- and CHEM 6000-level courses, which are largely equivalent, can't both be counted.

Areas of Specialization

Core and elective courses for commonly pursued areas of specialization are listed below. However, alternative course combinations, corresponding to other areas of specialization, may be approved by the director of graduate studies on request. The use of "or" in a listing implies that credit for the two courses can't both be used towards the degree. Courses can be chosen from the core or elective categories subject to any prerequisite requirements being met.

Code	Title	Credit Hours
Inorganic Chemistry Specialization		
Core		
CHEM 6170	Inorganic Chemistry I	3
CHEM 6172	Physical Methods in Inorganic Chemistry	3
Elective		
CHEM 6171	Inorganic Chemistry II	3
CHEM 6181	Chemical Crystallography	3
CHEM 6182	Chemistry of the Solid State	3
CHEM 6183	Organometallic Chemistry	3
CHEM 8813	Special Topics in Inorganic Chemistry	3
Analytical Chemistry Specialization		
Core		
CHEM 6271	Analytical Chemistry I	3
CHEM 6281	Mass Spectrometry	3
Elective		
CHEM 6272	Analytical Chemistry II	3
CHEM 6273	Analytical techniques for chemistry and biology	3
CHEM 6282	Chemical Sensors	3
CHEM 6283	Electroanalytical Chemistry	3
CHEM 6284	Environmental Analytical Chemistry	3
CHEM 6285	Analytical Spectroscopy	3
CHEM 6287	Scanned Probe Techniques	3
CHEM 6288	Analytical Separations	3
CHEM 8823	Special Topics in Analytical Chemistry	3
Organic Chemistry Specialization		
Core		
CHEM 6370	Organic Reaction Mechanisms	3
CHEM 6371	Identification of Organic Compounds	3
CHEM 6372	Physical Organic Chemistry	3
Elective		
CHEM 6373	Organic Synthesis	3
CHEM 6381	Advanced Organic Synthesis	3
CHEM 6382	Computational Methods in Organic Chemistry and Biochemistry	3
CHEM 8833	Special Topics in Organic Chemistry	3
Physical Chemistry Specialization		
Core		
CHEM 6481	Statistical Mechanics	3
or CHEM 6755	Theoretical Chemistry of Polymers	
CHEM 6491	Quantum Mechanics	3
or CHEM 64	Quantum Chemistry and Molecular Spectroscopy	
Elective		
CHEM 6471	Chemical Thermodynamics and Kinetics	3
CHEM 6482	Chemical Kinetics and Reaction Dynamics	3
CHEM 6483	Chemistry of Electronic Organic Materials	3
CHEM 6484	Chemistry of Optical Organic Materials	3
CHEM 6485	Computational Chemistry	3
CHEM 6492	Molecular Spectroscopy	3
CHEM 8843	Special Topics in Physical Chemistry	3
Biochemistry Specialization		
Core		
CHEM 6571	Enzymology and Metabolism	3
CHEM 6572	Macromolecular Structure	3
CHEM 6573	Molecular Biochemistry	3
Elective		
CHEM 6501	Biochemistry I	3

CHEM 6502	Biochemistry II	3
CHEM 6581	Protein Crystallography	3
CHEM 6582	Biophysical Chemistry	3
CHEM 6583	Drug Design and Discovery	3
CHEM 6584	Contemporary Biochemistry	3
CHEM 6756	Discovery of Signaling Molecules	3
CHEM 6760	Biocatalysis and Metabolic Engineering	3
CHEM 8853	Special Topics in Biochemistry	3
Polymer Chemistry Specialization		
Core		
CHEM 6750	Preparation and Reaction of Polymers	3
CHEM 6752	Polymer Characterization	4
Elective		
CHEM 6751	Physical Chemistry of Polymer Solutions	3
CHEM 6757	Advanced Polymer Chemistry	3
CHEM 8873	Special Topics in Polymer Chemistry	3

Master of City and Regional Planning

The Master of City and Regional Planning (MCRP) degree program prepares students to excel as professionals capable of understanding and resolving complex urban planning problems. The curriculum gives students both a broad understanding of the urban and regional environment and a foundation of skills needed to plan for this environment.

The MCRP program strives for a careful balance between the theoretical, historical, and conceptual knowledge about urban and regional development on the one hand, and the acquisition of practical skills and methods of analysis on the other. The program offers six specializations as well as dual degree program options with architecture, civil engineering, law, and public policy.

The applied studio course allows students to synthesize their planning knowledge and skills in a real-world situation ranging from neighborhood to metropolitan regions. Our studios are conducted locally throughout Atlanta, which provides an excellent laboratory, as well as nationally and internationally. Finally, a thesis or applied research paper provides an opportunity for focused study in the student's major area of specialization.

Students are admitted to the MCRP program to begin studies in the fall term only. With rare exceptions, involving transfer students and dual degree students, applicants will be considered for spring term admission. Applications must be completed by January 15 to ensure consideration for merit-based financial aid, and by February 15 if no financial aid is sought.

For more information about the MCRP program, contact:

Academic Advisor
Graduate Student Admissions, Advising, and Graduation Clearance
School of City and Regional Planning
College of Design
Georgia Institute of Technology
Atlanta, Georgia 30332-0155
Email: crp@design.gatech.edu

Master of City and Regional Planning

The curriculum is a two-year, fifty-five-semester-hour program. The curriculum requirements include seven core courses, a specialization, electives, and an internship. Two options exist for completing the curriculum: the thesis or the applied research paper.

The core courses are designed to impart fundamental planning knowledge applicable to wide sectors of the discipline. These include courses examining planning theory, planning methods, planning law, economic analysis, and planning practice. Students must earn a grade of C or better in all core courses to meet the core course requirements.

In the specialization coursework and the internship, the student develops skills focused on a particular aspect of city and regional planning. To enable students to focus their education on a consistent and cumulative body of knowledge, the program offers seven specializations: economic development, environment and health planning, global development, housing and community development, land use planning, transportation planning, and urban design.

In addition to the core and specialization areas, the curriculum includes electives that can be used to deepen the student's knowledge in a specialization or to broaden exposure to additional areas of planning. Students may take electives within the school, within the College of Design, in other schools at Georgia Tech (e.g., Architecture, Civil and Environmental Engineering, Public Policy, Information Systems, Earth and Atmospheric Sciences), or at other area universities such as Georgia State University or Emory University. Through the cross-registration system, students are allowed to enroll in a number of courses that are not offered at Georgia Tech.

Applied Research Paper Option

Code	Title	Credit Hours
Core Requirements		
CP 6035	Theory and History of Planning	3
CP 6036	Community Dynamics and Engagement	2
CP 6025	Advanced Planning Methods	4
CP 6514	Introduction to Geographic Information Systems	3
CP 6037	Planning Law, Regulation and Implementation	3
Approved course (from list of methods courses)		3
CP 6031	Economic Analysis for Planning	3
Select one of the following:		5-6
CP 6055	Planning Studio	
CP 6053	Applied Planning Studio (Urban Design)	
Specialization Requirements [1]		**12**
Capstone		
CP 8990	Applied Research Paper	4
Electives		**12-13**
Internship [2]		
Total Credit Hours		**55**

1. A minimum of 4 courses and 12 credit hours in one of the following Specializations: Economic Development, Environment & Health Planning, Housing & Community Development, Land Use, Transportation, Urban Design, Global Development.
2. All students are required to have planning-related work experience prior to graduation. Internships are designed to give the student practical experience

through on-the-job training. The internship requirement can be satisfied through employment for the equivalent of at least eight full-time weeks.

Thesis Option

Code	Title	Credit Hours
Core Requirements		
CP 6035	Theory and History of Planning	3
CP 6036	Community Dynamics and Engagement	2
CP 6025	Advanced Planning Methods	4
CP 6514	Introduction to Geographic Information Systems	3
CP 6037	Planning Law, Regulation and Implementation	3
Approved course (from list of methods courses)		3
CP 6031	Economic Analysis for Planning	3
Select one of the following:		5-6
CP 6055	Planning Studio	
CP 6053	Applied Planning Studio (Urban Design)	
Specialization Requirements [1]		**12**
Thesis Hours		
CP 7000	Master's Thesis	10
Electives		**12-13**
Internship [2]		
Total Credit Hours		**55**

[1] A minimum of 4 courses and 12 credit hours in one of the following Specializations: Economic Development, Environment & Health Planning, Housing & Community Development, Land Use, Transportation, Urban Design, Global Development

[2] All students are required to have planning-related work experience prior to graduation. Internships are designed to give the student practical experience through on-the-job training. The internship requirement can be satisfied through employment for the equivalent of at least eight full-time weeks.

Students pursuing the Master of City and Regional Planning have options to pursue other degrees by sharing coursework credit. The following programs have agreements:

Master of City and Regional Planning and Master of Architecture

The curriculum consists of the core requirements for each of the two professional programs and, in addition, a set of dual requirements that focus upon urban design as a common ground linking the theory and practice of the two disciplines. The curriculum builds upon five major bodies of material:

- Design studios as a basis for exploring architectural, urban design and development issues utilizing theory, method and professional practice paradigms
- Urban history and design theory as a way of understanding the formal and architectural order of the city
- Economics and development methods as a basis for formulating development projects
- Process and methods as a means of understanding professional practice and of designing policies and strategies that can be implemented in a private market regulated by public bodies
- The performance of design interventions in achieving specified economic, social, and environmental objectives

Click here for more information about the MCRP/MArch Option

Master of City and Regional Planning and Master of Science in Civil Engineering

The program in City and Regional Planning and Civil Engineering [Transportation Systems Engineering (TSE)] prepares students for careers influencing public policy and private investment in transportation systems. Such systems (including urban, suburban, ex-urban and rural highways, railways, public transit, pedestrian and bicycle facilities, rights# of#way, ports, terminals, parking and intermodal linkages) involve design and policy coordination that benefits from both engineering and planning. Graduates from this program become instrumental in bringing perspectives from one profession into the lexicon and tools of the other profession.

Click here for more information about the MCRP/MSCE Option.

Master of City and Regional Planning and Master of Science in Geographic Information Science and Technology

The programs in City and Regional Planning and Geographic Information Science and Technology (MCRP/MS-GIST) prepare students for employment in careers related to both geospatial technologies and city planning. This option enables graduates to address problem of planning (economic development, environment and health planning, global development, housing and community development, land use planning, transportation planning, and urban design) with a strong foundation of technology skills centered on the acquisition, management, analysis, and dissemination of information that is spatially-referenced to locations on, above, and below the surface of the earth.

Students completing both MCRP/MS-GIST degree programs will typically complete the program in two years and one semester. This option requires a total of 76 credit hours rather than the 89 credit hours required for separate completion of the two degrees. Other than counting 13 credits toward both degrees, students must meet all other program requirements for each separate degree, so graduates receive the full curriculum for both degrees.

Click here for more information about the MCRP/MSGIST Option.

Master of City and Regional Planning and Master of Science in Public Policy

The degree programs in Public Policy and City and Regional Planning prepares students for policy analysis and planning work at the national, state, and local levels. Graduates work in public, private, and non-profit settings building on the complementary perspectives and skills of the two professions.

In addition to providing interdisciplinary professional training, this option also provides the opportunity to step toward Ph.D. programs in either Public Policy or Planning with an emphasis on Urban, Environmental, or Economic Development Policy.

All students must complete a minimum combined requirement of 75 credit hours to meet requirements for both programs. Students receive a diploma for each program.

Click here for more information about the MCRP/MSPUBP Option

Master of City and Regional Planning and Juris Doctor Program (Cooperative Agreement with Georgia State University)
The cooperative J.D./MCRP program supports the interests of students who wish to pursue study in the fields of both law and city and regional planning, provides a focal point for exploring the connections between the two disciplines through the research and instruction between the two programs; and provides an educational opportunity that reflects the fact that land management law and city and regional planning have become increasingly integrated and interdisciplinary in nature. The program promotes a broader educational experience for today's land use law or planning professionals, by providing expertise in both disciplines.

The cooperative J.D./MCRP program will permit students to use credit hours earned in one program to satisfy some of the elective course requirements of the other program, thus permitting them to earn both degrees in a shorter time than would be possible pursuing both degrees separately.

Click here for more information about the MCRP/JD (with Georgia State University).

Master of Science in Civil Engineering

The School of Civil & Environmental Engineering (CEE) offers a challenging graduate program that encompasses advanced study and research leading to the degree of Master of Science in Civil Engineering.

Major Areas of Specialization

- Construction and Infrastructure Systems Engineering
- Environmental Engineering
- Geosystems Engineering
- Structural Engineering, Mechanics and Materials
- Transportation Systems Engineering
- Water Resources Engineering

Non-Thesis Option

21 of the 30 credit hours of coursework must be at the 6000 level or higher

Code	Title	Credit Hours
Area of Specialization		18
Approved Electives		12
Total Credit Hours		**30**

Thesis Option

21 of the 30 credit hours of coursework must be at the 6000 level or higher

Code	Title	Credit Hours
Area of Specialization		12
Approved Electives		12
CEE 7000	Master's Thesis	6
Total Credit Hours		**30**

Joint BS/MS Degree Program - Civil Engineering

The joint BS/MS program is designed to attract the best-of-the-best undergraduate students and is especially intended for students who demonstrate an interest in, and ability for, additional education beyond the bachelor's degree.

Students will be eligible to apply for the program after completion of 30 semester credit hours at Georgia Tech and appropriate progress in their degree program. As a practical matter, students should apply for the program at least three semesters prior to graduation in order to take graduate-level courses prior to receiving their BS degree. Students must have a Georgia Tech GPA of 3.5 or higher for admission into the BS/MS Program in Civil Engineering.

This program is available only to those completing a Bachelor's degree with the School of Civil and Environmental Engineering

Students in the joint BS/MS program remain undergraduates until they meet the requirements for the bachelor's degree, at which point they will receive the BSCE or BSEnvE degree. Their status will then be changed to graduate status. Graduate school application fees and the GRE requirements are waived.

Once admitted, a GPA of at least 3.0 must be maintained to remain in the program. Additionally, students in the BS/MS program are eligible to use the Graduate Course Option even if their cumulative grade-point average is below 3.5 at the time they complete their bachelor's degree.

Master of City and Regional Planning and Master of Science in Civil Engineering

The program in City and Regional Planning and Civil Engineering [Transportation Systems Engineering (TSE)] prepares students for careers influencing public policy and private investment in transportation systems. Such systems (including urban, suburban, ex-urban and rural highways, railways, public transit, pedestrian and bicycle facilities, rights# of#way, ports, terminals, parking and intermodal linkages) involve design and policy coordination that benefits from both engineering and planning. Graduates from this program become instrumental in bringing perspectives from one profession into the lexicon and tools of the other profession.

Click here for more information about the MCRP/MSCE Option

Master of Science in Computational Science and Engineering

The Master of Science in Computational Science and Engineering (CSE) Program is an interdisciplinary program offered by the College of Computing, the College of Engineering, and the College of Sciences. The CSE program addresses the body of knowledge, skills, and practices associated with the study of computer-based models of natural phenomena and engineered systems. Students will be required to obtain a breadth of knowledge across a set of core areas in the CSE discipline, depth of knowledge in a specific computational specialization (e.g., numerical computing), and knowledge to apply computational techniques in a domain of application. Students will be expected to integrate principles from mathematics, computer science, and engineering to be able to create significant computational artifacts (e.g., software).

Code	Title	Credit Hours
Core Curriculum		
Select four of the following:		12
CSE/MATH 6643	Numerical Linear Algebra	
CSE 6140	Computational Science and Engineering Algorithms	
CSE 6730	Modeling and Simulation: Foundations and Implementation	
CSE/ISYE 6740	Computational Data Analysis: Learning, Mining, and Computation	
CSE 6220	High Performance Computing	
Minor		
Select a specialization minor that includes one applications area. [1]		6
Select at least six hours of non-CS/CSE courses.		6
Course or Thesis Option		
Select one of the following: [2]		6
Course Option		
Thesis		
Total Credit Hours		**30**

[1] A specialization minor is required consisting of twelve hours of coursework relevant to the CSE discipline that includes one applications area; this must include at least six hours of courses that do not carry the CS/CSE course designation.

[2] Students must either complete 6 additional hours of approved coursework (course option) or an MS thesis (thesis option) that is defended to the student's thesis committee who is responsible for overseeing the student's research. Students must acquire the approval of their proposed program of study in their first semester of enrollment in the CSE program from both the student´s home unit coordinator and the CSE program director.

Shared Credit Agreement with Master of Science in Quantitative and Computational Finance and Master of Science in Computational Science and Engineering

The Master of Science in Quantitative and Computational Finance (MSQCF) and Master of Computational Science and Engineering (MSCSE)* Shared Credit Agreement allows for students admitted through the agreement to double-count 12 credits between both degree programs, for a total of 54 credits to earn both degrees. The double-counting will take place between the QCF Targeted/Free electives and the CSE home unit Application Specialization electives. The two QCF targeted electives will count as two of the CSE Application Specialization electives and the remaining two Application Specialization electives will count as two of the QCF free electives.

After completion of one semester of the program to which they have been admitted, students with a 3.5 GPA or above are eligible to apply through an internal application process to be evaluated for admission to the other program. (Special consideration may also be given to students admitted to both programs for their first term.) There is no penalty for not completing either degree should a student wish to drop the added major at a later point.

*Note: Industrial and Systems Engineering (ISYE) and Computational and Science Engineering (CSE) are the only home units of the MSCSE degree that are participating in the Shared Credit Agreement. The other home units are not participating at this time.

Master of Science in Computer Science

The program for the Master of Science in Computer Science (MSCS) prepares students for more highly productive careers in industry. Graduates receive the MSCS for completing one of three options in the program as described in this section. Students may apply to the program if they possess a bachelor's degree in computer science from an accredited institution. Students without a bachelor's degree in computer science are encouraged to apply as well, with the understanding that they will be required to complete remedial coursework appropriate to their background in addition to the requirements of the MSCS degree. All applicants are evaluated according to their prior academic record, scores on the Graduate Record Examination, a personal statement, and letters of recommendation. Applicants are selected for fall semester admission only. The application deadline is February 1. However, all applicants are encouraged to apply as early as possible because the selection process may begin well before the deadline.

Students entering the program must demonstrate a core competency in computing equivalent to undergraduate-level courses in the following areas:

- systems, design and analysis of algorithms,
- formal languages and automata theory,
- databases,
- networking and communications,
- computer architecture, and
- human-computer interaction.

This requirement can be satisfied by having taken undergraduate courses as a part of an undergraduate degree, taking remedial courses in the MS CS program, or by examination. Students may specialize in areas of their choice. Every student must complete at least one specialization as a part of their degree program. The current eleven specialization areas are:

- Computer Graphics, Computing Systems
- High-Performance Computing, Human-Computer Interaction
- Interactive Intelligence
- Machine Learning
- Modeling and Simulations
- Scientific Computing
- Social Computing
- Visual Analytics.

A student who is enrolled in another graduate program of the Institute may pursue an MSCS while that student is also pursuing their degree in the other major. To be granted permission to pursue the MSCS, a student must submit to the MS program coordinator of the College of Computing the material required for admission to the MSCS program. This includes transcripts, letters of recommendation, and GRE General Test. If the student is approved by the College to pursue the MSCS, the student will be notified in writing. At no time will a student outside the College be

allowed to pursue a concurrent degree without prior permission of the MS program coordinator of the College of Computing.

A student enrolled in the MS degree program in computer science who wishes to be admitted to the PhD program in computer science should apply via the same process as external students. It is expected that such a student will have at least two letters of recommendation from College of Computing faculty.

For more information about the MS CS program, visit www.cc.gatech.edu.

Program of Study

The College's master's degree requirements supplement the Institute's master's requirements listed in this catalog:

- Students must achieve a grade-point average of at least 3.0 to graduate, and no course grades below C will count toward graduation. Students must take all master's degree coursework on a letter-grade basis.
- Undergraduate courses required for the BSCS degree may not be used toward the MSCS degree. In addition, no graduate credit will be given for 3000 level courses or lower-level courses.
- No course may be used to satisfy the requirements of two degrees. In addition, no graduate credit will be given for CS courses with a number lower than 4140.
- A maximum of 6 hours may be taken at the 4000-level and/or with a subject code other than CS or CSE. See exceptions under the Project and Thesis options below.
- The maximum total credit hours of Special Problems (CS or CSE 89xx) that may be applied toward the MSCS degree is 3. These courses must be within the CoC.
- There is no maximum number of Special Topics (CS or CSE 88xx) courses that may be used towards the degree.
- Each student must complete the requirements for one specialization. Click here for specialization requirements.
- Students may choose from one of three options in pursuing the MSCS degree, including:

Course Option

This option requires the student to complete 30 hours of coursework.

Code	Title	Credit Hours
Total Course Credit Hours (no MS project or thesis hours)		30
CS and CSE (minimum 24 credit hours)		24
CS and CSE 6000-8000 Level Courses (minimum 24 credit hours)		24
6000/8000 Level Courses (minimum 24 credit hours)		24

Project Option

This option requires the student to complete 21 credit hours of coursework and a 9 credit hour project. The project requires approval by a faculty advisor and the MS program coordinator in the semester prior to its inception.

Code	Title	Credit Hours
Total Coursework Credit Hours		21
MSCS Project hours (CS 6999)		9
Total Credit Hours		30
CS and CSE Courses (minimum of 15 credit hours) [1]		15
CS and CSE 6000-8000 Level Courses (minimum of 15 credit hours) [1]		15

[1] May not include MS project or thesis hours.

Thesis Option

This option requires the student to complete 18 credit hours of coursework and a 12 credit hour thesis. The thesis process is defined elsewhere in this catalog.

Code	Title	Credit Hours
Total Coursework Credit Hours		18
MS Thesis Credit Hours [2]		12
Total Credit Hours		30
CS and CSE Courses (minimum of 15 credit hours) [1]		15
CS and CSE 6000-8000 Level Courses (minimum of 15 credit hours) [1]		15

[1] May not include MS project or thesis hours.

[2] The student must obtain advance approval of the thesis proposal by the faculty advisor and MSCS coordinator. See your academic advisor for more information about the thesis process.

Specializations

Computational Perception and Robotics

Code	Title	Credit Hours
Core Courses		
Algorithms: Pick one (1) of:		3
CS 6505	Computability, Algorithms, and Complexity	
CS 6515	Introduction to Graduate Algorithms	
CS 6520	Computational Complexity Theory	
CS 6550	Design and Analysis of Algorithms	
CS 7520	Approximation Algorithms	
CS 7530	Randomized Algorithms	
CSE 6140	Computational Science and Engineering Algorithms	
And, pick one (1) of:		3
CS 6601	Artificial Intelligence	
CS 7641	Machine Learning	
Electives		
Pick three (3) courses from Perception and Robotics, with at least one from each:		9
Perception		
CS 6475	Computational Photography	
CS 6476	Introduction to Computer Vision GR	
CS 7499	3D Reconstruction and Mapping in Computer Vision, Robotics, and Augmented Reality	
CS 7636	Computational Perception	
CS 7639	Cyber Physical Design and Analysis	
CS 7644	Machine Learning for Robotics	
CS 7650	Natural Language	
Robotics		
CS 7630	Autonomous Robotics	

CS 7631	Autonomous Multi-Robot Systems	
CS 7633	Human-Robot Interaction	
CS 7638	Artificial Intelligence Techniques for Robotics	
CS 7648	Interactive Robot Learning	
CS 7649	Robot Intelligence: Planning	
Total Credit Hours		**15**

Computer Graphics

Code	Title	Credit Hours
Core Courses		
Pick one of:		3
CS 6491	Foundations of Computer Graphics	
CS 6457	Video Game Design and Programming	
CS 7496	Computer Animation	
Pick one of:		3
CS 6505	Computability, Algorithms, and Complexity	
CS 6515	Introduction to Graduate Algorithms	
Electives: select three (3) of:		**9**
CS 6457	Video Game Design and Programming	
CS 6475	Computational Photography	
CS 6476	Introduction to Computer Vision GR	
CS 6491	Foundations of Computer Graphics	
CS 6492	Shape Grammars	
CS 6730	Data Visualization: Principles and Applications	
CS 7496	Computer Animation	
Total Credit Hours		**15**

Computing Systems

Code	Title	Credit Hours
Core Courses		
CS 6505	Computability, Algorithms, and Complexity	3
or CS 6515	Introduction to Graduate Algorithms	
And, pick two (2) of:		6
CS 6210	Advanced Operating Systems	
CS 6241	Design and Implementation of Compilers	
CS 6250	Computer Networks	
CS 6290	High-Performance Computer Architecture	
CS 6300	Software Development Process	
CS 6390	Programming Language Design	
CS 6400	Database Systems Concepts and Design	
Electives: pick three (3) of: [1,2]		**9**
CS 6035	Introduction to Information Security	
CS 6200	Graduate Introduction to Operating Systems	
CS 6220	Big Data Systems and Analytics	
CS 6235	Real-Time System Concepts and Implementation	
CS 6238	Secure Computer Systems	
CS 6260	Applied Cryptography	
CS 6262	Network Security	
CS 6263	Intro to Cyber-Physical Systems Security	
CS 6291	Embedded Software Optimizations	
CS 6310	Software Architecture and Design	
CS 6340	Advanced Topics in Software Analysis and Testing	
CS 6365	Intro Enterprise Comput.	
CS 6422	Database System Implementation	
CS 6550	Design and Analysis of Algorithms	
CS 6675	Advanced Internet Computing Systems and Applications	
CS 7210	Distributed Computing	
CS 7260	Internetworking Architectures and Protocols	
CS 7270	Networked Applications and Services	
CS 7280	Network Science: Methods and Applications	
CS 7290	Advanced Topics in Microarchitecture and organization of high-performance processors.	
CS 7292	Reliability and Security in Computer Architecture	
CS 7560	Theoretical Foundations of Cryptography	
CS 8803	Special Topics (Foundations of Programming Languages)	
CSE 6220	High Performance Computing	
Total Credit Hours		**18**

1 Any Core Courses in excess of the 9 hour requirement may be used as Computing Systems Electives

2 Any Special Topics (CS 8803) course that is being taught by a School of Computer Science faculty member may also count as a Computing Systems elective. The definition of "School of Computer Science faculty member" is a faculty member who appears on the School of Computer Science website https://scs.gatech.edu/people/faculty.

High-Performance Computing

Code	Title	Credit Hours
Core Courses		
CSE 6140	Computational Science and Engineering Algorithms	3
CSE 6220	High Performance Computing	3
Electives		
Pick three (3) of:		9
CSE 6221	Multicore Computing: Concurrency and Parallelism on the Desktop	
CS 6230	High-Performance Parallel Computing: Tools and Applications	
or CSE 6230	High Performance Parallel Computing: Tools and Applications	
CS 6241	Design and Implementation of Compilers	
CS 6290	High-Performance Computer Architecture	
CS 8803	Special Topics (Parallel Numerical Algorithms)	
or CSE 8803	Special Topics	
CSE 6236	Parallel and Distributed Simulation	
CSE 8803	Special Topics (Hot Topics in Parallel Computing)	
Total Credit Hours		**15**

Human-Centered Computing

Code	Title	Credit Hours
Core Courses		
CS 6451	Introduction to Human-Centered Computing	3
CS 6452	Prototyping Interactive Systems	3
CS 7455	Issues in Human-Centered Computing	3
Electives		
Pick two (2) of:		6
CS 6455	User Interface Design and Evaluation	
CS 6456	Principles of User Interface Software	
CS 6460	Educational Technology: Conceptual Foundations	
CS 6465	Computational Journalism	
CS 6470	Design of Online Communities	
CS 6471	Computational Social Science	
CS 6474	Social Computing	
CS 6476	Introduction to Computer Vision GR	
CS 6601	Artificial Intelligence	
CS 6730	Data Visualization: Principles and Applications	
CS 6750	Human-Computer Interaction	
CS 6795	Introduction to Cognitive Science	
CS 7450	Information Visualization	
CS 7451	Human-Centered Data Analysis	
CS 7460	Collaborative Computing	
CS 7641	Machine Learning	
CS 7470	Mobile and Ubiquitous Computing	
CS 7476	Advanced Computer Vision	
CS 7610	Modeling and Design	
CS 7632	Game Artificial Intelligence	
CS 7633	Human-Robot Interaction	
CS 7637	Knowledge-Based AI	
CS 7620	Case-Based Reasoning	
CS 7650	Natural Language	
CS 7695	Philosophy of Cognition	
CS 7697	Cognitive Models of Science and Technology	
CS 7790	Cognitive Modeling	
CS 8803	Special Topics (Computational Creativity)	
CS 8803	Special Topics (Expressive AI)	
CS 8803	Special Topics (Computers, Communications & International Development)	
Total Credit Hours		**15**

Human-Computer Interaction

Code	Title	Credit Hours
Core Courses		
CS 6456	Principles of User Interface Software	3
or CS 7470	Mobile and Ubiquitous Computing	
CS 6750	Human-Computer Interaction	3
Electives		
Pick three (3) from the two sub-areas below, including one from each sub-area:		9
Sub-area: Design and evaluation concepts		
CS 6010	Principles of Design	
CS 6320	Software Requirements Analysis and Specification	
CS 6455	User Interface Design and Evaluation	
CS 6457	Video Game Design and Programming	
CS 6460	Educational Technology: Conceptual Foundations	
CS 6465	Computational Journalism	
CS 6470	Design of Online Communities	
CS 6795	Introduction to Cognitive Science	
CS 7465	Educational Technology: Design and Evaluation	
CS 7467	Computer-Supported Collaborative Learning	
CS 7790	Cognitive Modeling	
Sub-area: Interactive technology		
CS 6440	Information to Health Informatics	
CS 6730	Data Visualization: Principles and Applications	
CS 6763	Design of Design Environments	
CS 6770	Mixed Reality Experience Design	
CS 7450	Information Visualization	
CS 7451	Human-Centered Data Analysis	
CS 7460	Collaborative Computing	
CS 7470	Mobile and Ubiquitous Computing	
Total Credit Hours		**15**

Interactive Intelligence

Code	Title	Credit Hours
Core Courses		
Take one (1) of:		3
CS 6300	Software Development Process	
CS 6301	Advanced Topics in Software Engineering	
CS 6505	Computability, Algorithms, and Complexity	
CS 6515	Introduction to Graduate Algorithms	
CSE 6140	Computational Science and Engineering Algorithms	
Take two (2) of:		6
CS 6601	Artificial Intelligence	
CS 7637	Knowledge-Based AI	
CS 7641	Machine Learning	
Electives		
Pick two (2) courses from:		6
Interaction		
CS 6440	Information to Health Informatics	
CS 6460	Educational Technology: Conceptual Foundations	
CS 6465	Computational Journalism	
CS 6471	Computational Social Science	
CS 6603	AI, Ethics, and Society	
CS 6750	Human-Computer Interaction	
AI Methods		
CS 6476	Introduction to Computer Vision GR	
CS 7631	Autonomous Multi-Robot Systems	

CS 7632	Game Artificial Intelligence	
CS 7633	Human-Robot Interaction	
CS 7634	AI Storytelling in Virtual Worlds	
CS 7643	Deep Learning	
CS 7647	Machine Learning with Limited Supervision	
CS 7650	Natural Language	
CS 8803	Special Topics (Advanced Game AI)	
Cognition		
CS 6795	Introduction to Cognitive Science	
CS 7610	Modeling and Design	
CS 7651	Human and Machine Learning	
CS 8803	Special Topics (Computational Creativity)	
Total Credit Hours		**15**

Machine Learning

Code	Title	Credit Hours
Core Courses		
Algorithms		
Pick one (1) of:		3
CS 6505	Computability, Algorithms, and Complexity	
CS 6515	Introduction to Graduate Algorithms	
CS 6520	Computational Complexity Theory	
CS 6550	Design and Analysis of Algorithms	
CS 7510	Graph Algorithms	
CS 7520	Approximation Algorithms	
CS 7530	Randomized Algorithms	
CSE 6140	Computational Science and Engineering Algorithms	
Pick one (1) of:		3
CS 7641	Machine Learning	
CSE 6740	Computational Data Analysis: Learning, Mining, and Computation	
Electives		
Pick three (3) of:		9
CS 6220	Big Data Systems and Analytics	
CS 6476	Introduction to Computer Vision GR	
CS 6603	AI, Ethics, and Society	
CS 7280	Network Science: Methods and Applications	
CS 7535	Markov Chain Monte Carlo Algorithms	
CS 7540	Spectral Algorithms and Representations	
CS 7545	Theoretical Foundations of Machine Learning	
CS 7616	Pattern Recognition	
CS 7626	Introduction to Behavioral Imaging	
CS 7642	Reinforcement Learning and Decision Making	
CS 7643	Deep Learning	
CS 7644	Machine Learning for Robotics	
CS 7646	Machine Learning for Trading	
CS 7650	Natural Language	
CS 8803	Special Topics (Probabilistic Graph Models)	
CSE 6240	Web Search and Text Mining	
CSE 6242	Data and Visual Analytics	
CSE 6250	Big Data Analytics for Healthcare	
ISYE 6416	Computational Statistics	
ISYE 6420	Introduction to Theory and Practice of Bayesian Statistics	
ISYE 6664	Stochastic Optimization	
Total Credit Hours		**15**

Modeling and Simulations

Code	Title	Credit Hours
Core Courses		
CSE 6730	Modeling and Simulation: Foundations and Implementation	3
Pick one (1) of:		3
CSE 6220	High Performance Computing	
ISYE 6644	Simulation	
MATH 6640	Introduction to Numerical Methods for Partial Differential Equations	
Electives		
Pick three (3) of:		9
CSE 6220	High Performance Computing	
CSE 6236	Parallel and Distributed Simulation	
CSE/CHEM 8803	Special Topics (Quantum Information, Computation, and Simulation)	
CS 7280	Network Science: Methods and Applications	
INTA 6742	Modeling, Simulation and Military Gaming	
ISYE 6644	Simulation	
MATH 6640	Introduction to Numerical Methods for Partial Differential Equations	
Total Credit Hours		**15**

Scientific Computing

Code	Title	Credit Hours
Core Courses		
CSE/MATH 6643	Numerical Linear Algebra	3
Pick one (1) of:		3
CSE/MATH 6644	Iterative Methods for Systems of Equations	
MATH 6640	Introduction to Numerical Methods for Partial Differential Equations	
Electives		
Pick three (3) of:		9
CS/CSE 6230	High-Performance Parallel Computing: Tools and Applications	
CS/CSE 8803	Special Topics (Parallel Numerical Algorithms)	
CSE 6140	Computational Science and Engineering Algorithms	
CSE 6220	High Performance Computing	
CSE/MATH 6644	Iterative Methods for Systems of Equations	
CSE 8803	Special Topics (Algorithms for Medical Imaging and Inverse Problems)	
CSE 8803	Special Topics (Computational Chemistry)	

MATH 6640	Introduction to Numerical Methods for Partial Differential Equations	
Total Credit Hours		**15**

Social Computing

Code	Title	Credit Hours
Core Courses		
Pick two (2) of:		6
CS 6470	Design of Online Communities	
CS 6474	Social Computing	
CS 6471	Computational Social Science	
Electives		
Pick three (3) classes including additional classes from above and:		9
CS 6238	Secure Computer Systems	
CS 6250	Computer Networks	
CS 6456	Principles of User Interface Software	
CS 6465	Computational Journalism	
CS 6505	Computability, Algorithms, and Complexity	
CS 6515	Introduction to Graduate Algorithms	
CS 6675	Advanced Internet Computing Systems and Applications	
CS 6730	Data Visualization: Principles and Applications	
CS 6750	Human-Computer Interaction	
CS 7210	Distributed Computing	
CS 7270	Networked Applications and Services	
CS 7280	Network Science: Methods and Applications	
CS 7450	Information Visualization	
CS 7451	Human-Centered Data Analysis	
CS 7467	Computer-Supported Collaborative Learning	
CS 7650	Natural Language	
Total Credit Hours		**15**

Visual Analytics

Code	Title	Credit Hours
Core Courses		
CSE 6242	Data and Visual Analytics	3
CS 6730	Data Visualization: Principles and Applications	3
CS 7450	Information Visualization	3
Electives		
Pick two (2) from:		6
CS 6456	Principles of User Interface Software	
CS 6465	Computational Journalism	
CS 6491	Foundations of Computer Graphics	
CS 6750	Human-Computer Interaction	
CS 6795	Introduction to Cognitive Science	
CS 7451	Human-Centered Data Analysis	
CS 7641	Machine Learning	
CSE 6740	Computational Data Analysis: Learning, Mining, and Computation	
Total Credit Hours		**15**

The Master of Science in Computer Science is also offered online.

For more information, visit: Online Master of Science in Computer Science.

Master of Science in Cybersecurity

The Master of Science in Cybersecurity degree program requires 32 credit hours of coursework (including a 5 credit practicum project course), Two of the core courses, which students in each specialization will take, will provide a broad overview of technology and policy dimensions of cybersecurity. Students are required to take a third core course that comes from one of the other specializations; e.g., a policy specialization student must take a course from the cyber-physical or information security track. Finally, a practicum project (5 credit hours) with common learning objectives across all participating units will be a core requirement. Each participating unit will decide required and elective courses for the MS Cybersecurity degree specialization offered by it (a total of 18 credit hours). These requirements have been defined by the participating units and are described in the next section.

Although all three participating schools will offer a single degree, MS Cybersecurity, the focus of the degree will depend on the specialization defined by the offering unit. In particular, each unit will offer the following specializations for the MS degree in Cybersecurity.

- The School of Cybersecurity and Privacy (SCP) offers the MS Cybersecurity degree with an information security specialization.
- The School of Electrical and Computer Engineering (ECE) offers the MS Cybersecurity degree with cyber-physical systems specialization.
- The School of Public Policy (PUBP) offers the MS cybersecurity degree with a policy specialization.

Program of Study

Code	Title	Credit Hours
Required Core Courses:		
CS 6035	Introduction to Information Security	3
PUBP/CS/ MGT 6725	Information Security Policies and Strategies	3
CS/ECE/ PUBP 6727	Cyber Security Practicum	5
Elective course	CS/PUBP/ECE 6000-level [1]	3
Specialization Requirements (see below for specialization specific requirements)		18
Total Credit Hours		**32**

[1] Public Policy students must take CS or ECE elective

GPA/Grade Requirements:

- Students must achieve a grade-point average of at least 3.0 to graduate
- No course grades below 'C' will count toward graduation
- Students must take all master's degree coursework on a letter-grade basis

Code	Title	Credit Hours
Information Security Specialization:		
CS 6260	Applied Cryptography	3
CS 6238	Secure Computer Systems	3
CS 6262	Network Security	3
CS 6265	Information Security Laboratory	3
or CS 6264	Information Security Lab: System and Network Defenses	
Select two courses:		6
CS 6210	Advanced Operating Systems	
CS 6250	Computer Networks	
CS 6255	Principles of Network Management	
CS 6300	Software Development Process	
CS 6310	Software Architecture and Design	
CS 6340	Advanced Topics in Software Analysis and Testing	
CS 6365	Intro Enterprise Comput.	
CS 6390	Programming Language Design	
CS 6400	Database Systems Concepts and Design	
CS 6675	Advanced Internet Computing Systems and Applications	
CS 7210	Distributed Computing	
CS 7230	Systems Software Design, Implementation, and Evaluation	
CS 7260	Internetworking Architectures and Protocols	
CS 7270	Networked Applications and Services	
CS 7292	Reliability and Security in Computer Architecture	
CS 8803	Mobile Applications and Services	
Total Credit Hours		**18**

Code	Title	Credit Hours
Cyber-Physical Systems Specialization:		
ECE 6320	Power Systems Control and Operation	3
ECE 8813	Special Topics (Introduction to Cyber-Physical Electric Energy Systems)	3
ECE 8813	Special Topics (Introduction to Cyber-Physical Systems Security)	3
ECE 8803	Special Topics (Computational Aspects of Cyber-Physical Systems or Cyber Physical Design and Analysis)	3
Select two courses:		6
ECE 6550	Linear Systems and Controls	
ECE 6607	Computer Communication Networks	
ECE 6615	Sensor Networks	
ECE 6102	Dependable Distributed Systems	
ECE 6323	Power System Protection	
ECE 8813	Special Topics (Advanced Computer Security)	
ECE 8813	Special Topics (Network Forensics)	
ECE 8813	Special Topics (Smart Grids)	
ECE 8803	Special Topics (Advanced Topics in Malware)	
ECE 8873	Special Topics (Advanced Hardware Oriented Security and Trust)	
Total Credit Hours		**18**

Code	Title	Credit Hours
Policy Specialization:		
Select 4 courses:		12
CS 8803	Special Topics (Security Operations and Incident Response)	
INTA 6014	Scenario Writing and Path Gaming	
INTA 6103	International Security	
INTA 6450	Data Analytics and Security	
MGT/CS/ PUBP 6726	Privacy, Technology, Policy, and Law	
PUBP 6111	Internet and Public Policy	
PUBP 6501	Information Policy and Management	
PUBP 6502	Information and Communications Technology Policy	
Electives [1]		6
Total Credit Hours		**18**

[1] Free electives which may be satisfied by courses from any of the specializations

The Master of Science in Cybersecurity is also offered online.

For more information, visit: Online Master of Science in Cybersecurity.

Master of Science in Digital Media

The Digital Media graduate program at Georgia Tech provides students with a foundation in digital media design and making, a theoretical background in digital media, and the opportunity to practice what is learned in studio courses, labs, and research. Here at Georgia Tech, we focus on the cultural context of digital media making, where graduate students learn to *make with meaning*. The resources, facilities and industry connections established and maintained by the program make our students some of the most sought-after graduates in the field today.

The MS DM program accepts roughly 20-25 full-time students each fall term. MS DM students come from a range of educational backgrounds and have diverse intellectual and creative objectives. Many have work experience in a professional field. The program welcomes a socially diverse and international student body. For more information visit: http://dm.lmc.gatech.edu/program/ms-program/

To graduate with the Master of Science in Digital Media, students must take a minimum of 36 credit hours while meeting the following requirements:

Code	Title	Credit Hours
First Year - Fall Semester		
LMC 6310	The Computer as an "Expressive Medium" [4]	3
LMC 6399	Discovery & Invention [4]	3
First Year - Spring Semester		
LMC 6313	Principles of Interaction Design [4]	3
Fall and/or Spring		

LMC 6650	Project Studio (may be taken multiple times) [1,4]	6
Electives		
Electives [2,5]		15
Project or Thesis		
Select one of the following:		6
LMC 6800	Digital Media Master's Project	
LMC 7000	Digital Media Master's Thesis	
Summer Internship [3]		0
Total Credit Hours		**36**

1. Students are invited to repeat the same Project studio for all four semesters of the program and to do their Masters Project/Thesis in a related area. Please note that all MS students are required to take two (2) sections of LMC 6650, each for 3 credit hours.
2. Students may choose from elective courses in DM or related disciplines, such as Architecture, Industrial Design, Cognitive Science, Computing, Management, or Policy Studies. If a student chooses to take more than three elective courses outside DM, the student must obtain approval from the DM Director of Graduate Studies.
3. 8-10 week full-time internship between the first and second year.
4. Must be completed with a grade of 'B' or higher
5. Must be completed with a grade of 'C' or higher

BS/MS Degree Program

Students who wish to pursue the BS/MS combination in LMC and DM must apply to the School after completing at least seventy-five credit hours of work toward an LMC degree that includes the Design thread. Applicants should have a 3.5 GPA.

Students admitted to the program take a total of twelve credit hours of graduate coursework during their final undergraduate year. Six credit hours of that work, in DM media courses, will replace any 4000-level course and will count for both undergraduate and graduate credit. During the summer term after their fourth year, students will participate in an approved internship program. During the fifth year, students will take a total of twenty-four credit hours, including either LMC 6800 or LMC 7000, and with no more than three courses taken outside the DM program.

Master of Science in Earth and Atmospheric Sciences

Students can choose a program of study leading to either the designated master's degree (with thesis) or the undesignated master's degree (without thesis). General requirements for both degrees are found in this catalog under "Information for Graduate Students." In either program of study, students can specialize in atmospheric chemistry, aerosols, and clouds; dynamics of weather and climate; geochemistry; geophysics; oceanography; paleoclimate; planetary science; and remote sensing. With approval of the School's faculty, multidisciplinary programs of study are also permitted. Students entering the master's degree program need an academic background that includes a minimum of one year of university-level courses in calculus, chemistry, and physics. Students who lack this academic background are required to complete appropriate remedial courses, for which they will not receive graduate credit.

Thesis Option

Code	Title	Credit Hours
Core Courses		**12**
EAS 6000-level or above		
Elective courses in major area		**6**
EAS 4000-level or above		
Undesignated courses (may include thesis hours)		**6**
EAS 7000	Master's Thesis	6
Total Credit Hours		**30**

1. A maximum of 3 credit hour may be taken under the Pass/Fail designation (except for thesis hours)
2. Thesis hours are only taken on a Pass/Fail designation and cannot be used to fulfill the credit hour requirements for a non-thesis degree

Non-Thesis Option

Code	Title	Credit Hours
Core Courses		**12**
EAS 6000-level or above		
Elective courses in major area		**6**
EAS 4000-level or above		
Elective courses		9
EAS 6000-level or above		
EAS 8901	Special Problems [1]	3
Total Credit Hours		**30**

1. Course under the form of a research project supervised by the student's EAS advisor and culminating in a written final report

BS/MS Earth and Atmospheric Sciences

EAS offers a BS/MS Program. EAS majors may apply to the BS/MS program after completing at least thirty semester credit hours at Georgia Tech with a GPA of at least 3.5.

Students admitted to the program must maintain a cumulative GPA of at least 3.0.

As part of the program, students may use up to 6 credit hours of graduate-level coursework in the major discipline for both degrees.

To apply, complete the BS/MS application form, a biographical statement, and two letters of recommendation.

EAS Undergraduate Information

Master of Science in Economics

The Master of Science in Economics program curriculum is designed to enhance quantitative and analytical skills.

The MS in Economics is open to all individuals with diverse backgrounds and needs. However, the curriculum is especially geared toward the following individuals:

- Undergraduates with a desire to enhance analytical skills to be more competitive or command a higher salary in the job market

- Individuals with a desire to strengthen one's application before pursuing an additional graduate degree
  - Commonly this is a doctorate in Economics but our students also pursue Juris Doctorates, MBAs, and Ph.D.'s in related fields such as public policy or international affairs
- Engineers who seek to use their quantitative skills in an applied business, data analysis, or decision-making context
- Working individuals who are looking to formalize and broaden their expertise to advance their careers or become more effective in their current roles.

Internship Option

Minimum course credit hours at 6000 to 9000 level: 21

Code	Title	Credit Hours
ECON 6105	Macroeconomics	3
ECON 6106	Microeconomic Analysis	3
ECON 6140	Econometrics I	3
ECON 6160	Econometrics II	3
Economics Electives		12
Internship		3
Advisor approved electives		3
Total Credit Hours		**30**

Coursework Option

Minimum course credit hours at 6000 to 9000 level: 24

Code	Title	Credit Hours
ECON 6105	Macroeconomics	3
ECON 6106	Microeconomic Analysis	3
ECON 6140	Econometrics I	3
ECON 6160	Econometrics II	3
Economics electives		12
Advisor approved electives		6
Total Credit Hours		**30**

Within those 30 credit hours, the student must choose 12 credit hours of Economics elective courses and 6 credits hours of elective courses either in Economics or in complementary areas such as Mathematics, Statistics, Industrial Engineering, Civil Engineering, International Affairs, various areas in Management, or Public Policy, among other areas. The selection of these electives will be based on the student's chosen areas of concentration. The SOE Director of Graduate Studies along with the Academic Advisor will grant approvals for these courses.

Students must earn at least a 'C' in order for coursework to be considered towards degree requirements.

Students must have an overall GPA of at least 2.70 at the time of graduation

Master of Science in Electrical and Computer Engineering

The master's degree allows students to pursue advanced work in electrical and computer engineering technical interest areas including bioengineering, computer systems and software, digital signal processing, electrical energy, electromagnetics, electronic design and applications, microsystems, optics and photonics, systems and controls, telecommunications, and VLSI systems and digital design.

The master's degree program requires 30 credit hours beyond the bachelor's degree, including a minor outside ECE. Both thesis and non-thesis options are available. Courses are offered all three terms; however, full-time students planning to complete the MS degree in 12 months should start their programs in the fall semester.

MS Information

Program of Study

General Requirements (for non-thesis and thesis)

- Students are required to complete all degree requirements within 6 consecutive years and maintain a 2.7 GPA.
- The Institute permits up to 3 hours to be pass/fail (P/F) and up to 6 hours of transfer credit to be used toward a master's degree. ECE specifies that the 3 P/F hours must be ECE seminars (8001, 8002, 8003, and 6792). ECE 8022 (Professional Communication Skills) is also offered on a pass/fail basis and can be used. **Pass/fail hours can only be used toward the M.S. non-thesis option.**

Non-Thesis Option:

General Information for Non-thesis

- Classes used toward the M.S. degree must have grades of "C" or higher.
- At least 21 hours must be at 6000 level or above; no more than 6 hours may be Special Problems; the electives may include up to 3 ECE seminar hours.

Code	Title	Credit Hours
Group I [1]		9
Group II [2,4]		9
Group III [3,4]		12
Total Credit Hours		**30**

1. 6000-level of higher ECE classes in one or two Technical Interest Areas (TIAs)
2. 6000-level or higher ECE classes, at least two of which come from Technical Interest Area(s) other than those in Group I. These six hours may not be cross-listed with the technical interest area(s) from Group I.
3. Courses can be outside ECE. No more than nine (9) hours of 4000 level courses. No more than three (3) hours of approved Pass/Fail seminars.

[4] A combined maximum of 6 VIP (Group II and/or III) or special problems (Group III) credits can count toward the degree requirements. Additional VIP or special problems credits cannot be applied.
Non-thesis students can count up to 6 credits of VIP coursework toward Group II and Group III as follows:
- The first 3 credits of 6000-level VIP courses can count as Group III (electives)
- The second 3 credits of 6000-level VIP courses can count as Group II or Group III (electives), and
- Students must submit a publication-quality paper. All six credits must be with the same VIP Team

Thesis Option:

Code	Title	Credit Hours
Group I [1]		6
Group II [2]		6
Group III [3]		6
Thesis Research		12
Responsible Conduct of Research (see paragraph below)		
Total Credit Hours		**30**

[1] 6000-level of higher ECE classes in one or two Technical Interest Areas (TIAs)

[2] 6000-level or higher ECE classes, at least two of which come from Technical Interest Area(s) other than those in Group I. These six hours may not be cross-listed with the technical interest area(s) from Group I.

[3] Six (6) hours of coursework may be outside of ECE--not required to be in same discipline.

Responsible Conduct of Research (RCR) Requirement for M.S. Thesis

The Responsible Conduct of Research (RCR) Academic policy requires Masters students enrolled in 7000 thesis hours to complete the appropriate RCR training requirement before the Request for Approval of Master's Thesis Topic Form can be processed.

First Option - Successfully complete the online CITI RCR course

Second Option - Successfully complete an in-person requirement - PHIL 6000 has been approved for ECE doctoral students and may also be used for M.S. Thesis students. ECE does not have its own in-house RCR course but will accept an academic program's in-house RCR training approach (Please see the Ph.D. section of this handbook for approved courses).

More information pertaining to this new RCR policy can be found online.

BS/MS Electrical and Computer Engineering

This program allows highly qualified students to receive the Bachelor of Science in either Electrical Engineering or Computer Engineering and a master's degree in Electrical and Computer Engineering. The joint BS/MS degree program affords undergraduate electrical or computer engineering majors the opportunity to broaden their studies and improve their career prospects.

Eligible Georgia Tech undergraduates normally apply for this program during their junior year. Contact the Electrical and Computer Engineering Graduate Affairs Office for program information, eligibility requirements, and applications.

Master of Science in Engineering Science and Mechanics

The School of Civil & Environmental Engineering (CEE) offers a challenging graduate program that encompasses advanced study and research leading to the degree of Master of Science in Engineering Science and Mechanics. Students seeking this degree must have a Bachelor of Science in engineering or the physical sciences.

Non-Thesis Option

21 of the 30 credit hours of coursework must be at the 6000 level or higher

Code	Title	Credit Hours
Mechanics		18
Mathematics		6
Approved Electives		6
Total Credit Hours		**30**

Thesis Option

21 of the 30 credit hours of coursework must be at the 6000 level or higher

Code	Title	Credit Hours
Mechanics		12
Mathematics		6
Approved Electives		6
CEE 7000	Master's Thesis	6
Total Credit Hours		**30**

Master of Science in Environmental Engineering

The School of Civil & Environmental Engineering (CEE) offers a challenging graduate program that encompasses advanced study and research leading to the degree of Master of Science in Environmental Engineering.

Non-Thesis Option

21 of the 30 credit hours of coursework must be at the 6000 level or higher

Code	Title	Credit Hours
Environmental Engineering Core Courses		15
Approved Electives		15
Total Credit Hours		**30**

Thesis Option

21 of the 30 credit hours of coursework must be at the 6000 level or higher

Code	Title	Credit Hours
Environmental Engineering Core Courses		15
Approved Electives		9
CEE 7000	Master's Thesis	6
Total Credit Hours		**30**

Non-Thesis Option

21 of the 30 credit hours of coursework must be at the 6000 level or higher

Code	Title	Credit Hours
Environmental Engineering Core Courses		15
Approved Electives		15
Total Credit Hours		**30**

Thesis Option

21 of the 30 credit hours of coursework must be at the 6000 level or higher

Code	Title	Credit Hours
Environmental Engineering Core Courses		15
Approved Electives		9
CEE 7000	Master's Thesis	6
Total Credit Hours		**30**

Joint BS/MS Degree Program - Environmental Engineering

The joint BS/MS program is designed to attract the best-of-the-best undergraduate students and is especially intended for students who demonstrate an interest in, and ability for, additional education beyond the bachelor's degree.

Students will be eligible to apply for the program after completion of 30 semester credit hours at Georgia Tech and appropriate progress in their degree program. As a practical matter, students should apply for the program at least three semesters prior to graduation in order to take graduate-level courses prior to receiving their BS degree. Students must have a Georgia Tech GPA of 3.5 or higher for admission into the BS/MS Program in Environmental Engineering.

This program is available only to those completing a Bachelor's degree within the School of Civil and Environmental Engineering.

The key components of this program are intense interaction among students and faculty, including mentoring and undergraduate research, and careful advising and course planning to enable students to begin challenging coursework in their fourth year of study.

Students in the joint BS/MS program remain undergraduates until they meet the requirements for the bachelor's degree, at which point they will receive the BSEnvE or BSCE degree. Their status will then be changed to graduate status. Graduate school application fees and the GRE requirements are waived.

Once admitted, a GPA of at least 3.0 must be maintained to remain in the program. Additionally, students in the BS/MS program are eligible to use the Graduate Course Option even if their cumulative grade-point average is below 3.5 at the time they complete their bachelor's degree.

Master of Science in Geographic Information Science and Technology

Geographic Information Science (GIS) is an emerging field of study centered on the acquisition, management, analysis, and dissemination of information that is spatially-referenced to locations on, above, and below the surface of the earth. This field is highly trans-disciplinary with substantial and growing importance in a number of traditional academic disciplines and related professions including city and regional planning, architecture, civil and environmental engineering, earth and atmospheric sciences, environmental science, demography, logistics, management, public policy and sustainability studies. Full-time students can complete the 34 credit-hour curriculum in one calendar year including two semesters of full-time coursework and a capstone project course offered during the summer. Part-time students may complete the program in two or three academic years plus one summer session for the capstone project course.

For more information about the MS-GIST program, contact:

MS-GIST Program Director
School of City and Regional Planning
College of Design
Georgia Institute of Technology
Atlanta, Georgia 30332-0155
Email: crp@design.gatech.edu

- Master of Science in Geographic Information Science and Technology

The components of the current MSGIST curriculum are:

Prerequisite Course

A basic understanding of GIS technology is required as a prerequisite of the degree program.

This may be achieved through one of four options:

- CP 4510 Geographic Information Systems or
- CP 6514 Introduction to Geographic Information Systems or
- Equivalent coursework at another institution (as evaluated by the program coordinator)
- One year of equivalent professional experience (as evaluated by the program coordinator)

Code	Title	Credit Hours
Core Courses		
CP 6006	Visualization for Planners	1
CP 6024	Quantitative and Computer Methods	4
CP 6521	Advanced Geographic Information Systems	3
CP 6531	Introduction to Remote Sensing	3
CP 6581	Programming for Geographic Information Systems	3

CP 6591	GIS Professionalization	1
CP 6592	Capstone Project Research	1
CP 6595	GIS Systems Design and Management	3
CP 6596	GIS Capstone Project	3
Specialized GIS Courses		
Select two: [1]		6
CP 6570	Socioeconomic GIS	
CP 6541	Environmental Analysis Using GIS	
CP 6542	Transport & GIS	
Free Electives [2]		**6**
Total Credit Hours		**34**

1 INFO 530 Geographic Information Systems for Public Health (in the Emory School of Public Health) can be used here.

2 Students can select two additional courses as free electives. These will typically include additional specialized GIS courses or courses in GIS-related substantive areas such as city planning, architecture, public policy, civil engineering, or environmental engineering.

Master of Science in Global Development

The Master of Science in Global Development is a 12-month program designed to prepare professionals for sustainable development work in governments, private development firms, and NGOs in developing countries, primarily in Africa, Asia-Pacific, the Caribbean, and Latin America.

The program responds to the substantial challenges of rapid urbanization, climate change, and growing inequality in cities of developing regions and draws on concepts and skills from economics, politics, city and regional planning, and international affairs. Students will gain multidisciplinary knowledge and training needed to help address challenges in anything from infrastructure provision to poverty reductions.

Students take classes in Georgia Tech's School of City and Regional Planning, School of Economics, and Sam Nunn School of International Affairs.

Code	Title	Credit Hours
Core		
INTA/ECON 6704	Introduction to Global Development	3
INTA 6003	Empirical Research Methods	3
CP 6514	Introduction to Geographic Information Systems	3
One of the following:		3
INTA 8803	Special Topics (Political Economy of Development)	
ECON 6360	Development Economics	
INTA 6202	Comparative Politics	
CP 6233	Sustainable Urban Development	
One of the following:		3
CP 6052	Applied Planning Studio	
or CP 6053	Applied Planning Studio (Urban Design)	
INTA 8803	Special Topics (Graduate Capstone in Global Development)	
or ECON	Special Topics	
Electives		**15**
INTA 6011	International Trade and Technology Transfer	
INTA 6302	International Political Economy	
INTA 6306	Globalization	
INTA/CS 6745	Information and Communication Technologies and Global Development	
INTA 6753	Comparative Science and Technology Policy	
INTA 8803	Special Topics (User Interface Design and Evaluation)	
INTA 8803	Special Topics (Sustainable Megaregion)	
INTA 8803	Special Topics (Democracy in the Global South)	
INTA 8803	Special Topics (Latin American Politics)	
INTA 8803	Special Topics (Political Economy of China)	
INTA 8803	Special Topics (Government and Politics-China)	
INTA 8803	Special Topics (Urbanization and Development in the LDCs)	
INTA 8803	Special Topics (Technology and Poverty)	
INTA 8803	Special Topics (Big Data and Security)	
INTA 8803	Special Topics (Environmental Politics)	
INTA 8803	Special Topics (Soccer and Global Politics)	
INTA 8803	Special Topics (Energy, Environment, and Policy)	
INTA 8803	Special Topics (Energy and International Security)	
INTA 8803	Special Topics (Global Issues and Leadership)	
INTA 8803	Special Topics (Post-Soviet Politics)	
INTA 8803	Special Topics (Gender and Global Development)	
INTA 8803	Special Topics (Challenge of Terrorism)	
INTA 8803	Special Topics (Conflict and Security in Developing Countries)	
CP 6032	Urban and Regional Development Theory	
CP 6112	Introduction to Land Use Planning	
CP 6190	Introduction to Climate Change Planning	
CP 6217	Climate Change and the City	
CP 6311/ CEE 6602	Introduction to Transportation Planning	
CP 6331	Land Use and Transportation Interaction	
CP 6412/ PUBP 6600	Foundations of Local Economic Development Planning and	
CP 6422	Economic Development Analysis and Practice	
CP 6241	Water Resources Planning	
CP 6442	Equity, Social Justice, and Economic Development	
CP 6541	Environmental Analysis Using GIS	
CP 6570	Socioeconomic GIS	
CP 6831	Urban Growth and Infrastructure Systems	
CP 6611	Principles of Real Estate Finance and Development	

CP 6612	Community Development	
CP 6630	Government and Housing Markets	
CP 6640	Applied Real Estate Development Methods	
CP 6680	Citizen Participation and Community Engagement	
CP 6834	Urban Design Policy: Analysis and Implementation	
CP 6836	Urban Ecological Design	
CP 8300	Advanced Urban and Regional Development Theory	
CP 8813	Special Topics in Land Use Planning (International Growth Management Law)	
ECON 6106	Microeconomic Analysis	
ECON 6160	Econometrics II	
ECON 6330	Urban and Regional Economics	
ECON 6380	Economics of Natural Resources and the Environment	
ECON 6431	Strategic Economics for Global Enterprise	
ECON 6510	Economics of Health and Health Care	
ECON 8803	Special Topics (The World Trading System: Law, Economics and Corporate Strategy)	
Total Credit Hours		**30**

Master of Science in Health Systems

The focus of the Health Systems is to develop, apply, and disseminate new knowledge with respect to the analysis, planning, implementation, demonstration, and evaluation of operational and managerial systems for the delivery of healthcare services to the public.

MS Health Systems Information

Program Requirements

Code	Title	Credit Hours
Core		
HS 6000	Introduction to Healthcare Delivery	3
Core Practice (Choose 1):		**3**
HS 6400	Health Systems Practice	
ISYE 6320	Public Impact Applications of Operations Research and Management Science	
Core Practice (Choose 1):		**3**
HS 6200	Healthcare Financial Management	
ISYE 6225	Advanced Engineering Economy	
ISYE 6227	Introduction to Financial Engineering	
MGT 6000	Financial and Managerial Accounting I	
MGT 6060	Financial Management	
Core Methodology (Choose 3):		**9**
ISYE 6414	Statistical Modeling and Regression Analysis	
ISYE 6421	Biostatistics	
or BMED	Biostatistics	
ISYE 6644	Simulation	
ISYE 6650	Probabilistic Models and Their Applications	
ISYE 6669	Deterministic Optimization	
ISYE 6679	Computational Methods in Optimization	
Technical Electives (Choose 3):		**9**
ARCH 6243	Evidence-Based Design	
ARCH 6271	Healthcare Design of the Future	
BIOL 6150	Genomics and Applied Bioinformatics	
BMED 6507	Medical Device Regulatory Requirements	
CS 6150	Computing For Good	
CS 6440	Information to Health Informatics	
CSE 6242	Data and Visual Analytics	
CSE 6730	Modeling and Simulation: Foundations and Implementation	
ECON 6150	Cost-Benefit Analysis	
ECON 6510	Economics of Health and Health Care	
HP 6601	Industrial Hygiene	
HTS 6122	History of Medicine	
ISYE 6202	Warehousing Systems	
ISYE 6405	Statistical Methods for Manufacturing Design and Improvement	
ISYE 6402	Time Series Analysis	
ISYE 6404	Nonparametric Data Analysis	
ISYE 6413	Design and Analysis of Experiments	
or ISYE 7	Advanced Design of Experiments	
ISYE 6416	Computational Statistics	
ISYE 6420	Introduction to Theory and Practice of Bayesian Statistics	
ISYE 6740	Computational Data Analysis: Learning, Mining, and Computation	
ISYE 6805	Reliability Engineering	
ISYE 7406	Data Mining and Statistical Learning	
PUBP 6001	Introduction to Public Policy	
Free Elective [1]		**3**
Total Credit Hours		**30**

Up to six (6) credits of 4000-level courses may be used towards the degree, subject to the approval of the ISyE Director of Master's Programs.

[1] ISYE 6739 cannot be used toward Free Elective

Predictive Health Track Requirements

Code	Title	Credit Hours
Core		
Select 6 courses		18
HS 6000	Introduction to Healthcare Delivery	
ISYE 6669	Deterministic Optimization	
ISYE 6650	Probabilistic Models and Their Applications	
ISYE 6644	Simulation	
ISYE 6414	Statistical Modeling and Regression Analysis	
ISYE 7406	Data Mining and Statistical Learning	
Select one course		3
HS 6400	Health Systems Practice	
ISYE 6320	Public Impact Applications of Operations Research and Management Science	
Select one course		3
MGT 6000	Financial and Managerial Accounting I	

MGT 6060	Financial Management	
ISYE 6225	Advanced Engineering Economy	
ISYE 6227	Introduction to Financial Engineering	
HS 6200	Healthcare Financial Management	
Health Systems Elective		**3**
ARCH 6243	Evidence-Based Design	
ARCH 6271	Healthcare Design of the Future	
BIOL 6150	Genomics and Applied Bioinformatics	
BIOL 7023	Bioinformatics	
BMED 6507	Medical Device Regulatory Requirements	
ISYE 6421	Biostatistics	
or BMED	Biostatistics	
BMED 6789	Technology Ventures	
BMED 7411	Mathematical Models in Biology & Medicine	
CS 6150	Computing For Good	
CS 6440	Information to Health Informatics	
ECON 6510	Economics of Health and Health Care	
HP 6601	Industrial Hygiene	
HTS 6122	History of Medicine	
Free Elective [1]		**3**
Total Credit Hours		**30**

[1] ISYE 6739 cannot be used toward Free Elective

Practicum Track Requirements

Code	Title	Credit Hours
Core		
HS 6000	Introduction to Healthcare Delivery	3
Core Practice (Choose 1):		**3**
HS 6400	Health Systems Practice	
ISYE 6320	Public Impact Applications of Operations Research and Management Science	
Core Practice (Choose 1):		**3**
HS 6200	Healthcare Financial Management	
ISYE 6225	Advanced Engineering Economy	
ISYE 6227	Introduction to Financial Engineering	
MGT 6000	Financial and Managerial Accounting I	
MGT 6060	Financial Management	
Core Methodology (Choose 3):		**9**
ISYE 6414	Statistical Modeling and Regression Analysis	
ISYE 6421	Biostatistics	
or BMED	Biostatistics	
ISYE 6644	Simulation	
ISYE 6650	Probabilistic Models and Their Applications	
ISYE 6669	Deterministic Optimization	
ISYE 6679	Computational Methods in Optimization	
Technical Electives (Choose 3):		**9**
ARCH 6243	Evidence-Based Design	
ARCH 6271	Healthcare Design of the Future	
BIOL 6150	Genomics and Applied Bioinformatics	
BMED 6507	Medical Device Regulatory Requirements	
CS 6150	Computing For Good	
CS 6440	Information to Health Informatics	
CSE 6242	Data and Visual Analytics	
CSE 6730	Modeling and Simulation: Foundations and Implementation	
ECON 6150	Cost-Benefit Analysis	
ECON 6510	Economics of Health and Health Care	
HP 6601	Industrial Hygiene	
HTS 6122	History of Medicine	
ISYE 6202	Warehousing Systems	
ISYE 6405	Statistical Methods for Manufacturing Design and Improvement	
ISYE 6402	Time Series Analysis	
ISYE 6404	Nonparametric Data Analysis	
ISYE 6413	Design and Analysis of Experiments	
or ISYE 7	Advanced Design of Experiments	
ISYE 6416	Computational Statistics	
ISYE 6420	Introduction to Theory and Practice of Bayesian Statistics	
ISYE 6740	Computational Data Analysis: Learning, Mining, and Computation	
ISYE 6805	Reliability Engineering	
ISYE 7406	Data Mining and Statistical Learning	
PUBP 6001	Introduction to Public Policy	
Internship Preparation Elective [1]		**3**
ISYE 6320	Public Impact Applications of Operations Research and Management Science	
Practicum		
COOP/INTN/ISYE Practicum		
Total Credit Hours		**30**

Up to six (6) credits of 4000-level courses may be used towards the degree, subject to the approval of the ISyE Director of Master's Programs.

[1] ISYE Special Topics courses, as appropriate

BS/MS OPTION

The BSMS Option allows eligible students to double count a maximum of 6 credit hours toward undergraduate and graduate requirements while still completing all other program requirements to earn both degrees.

BS in Industrial Engineering students with a GPA of 3.5 or higher who have taken ISYE 3133 and ISYE 3232 are eligible to apply to utilize the BSMS Option. BSIE students must also graduate with a GPA of 3.5 or higher in order to utilize the BSMS Option.

It is typical for students to use 6 hours from the BSIE concentration electives to count as Core Courses or Technical Electives for the MS in Health Systems degree. Students will need to consult with an advisor to indicate which courses are sharing with the graduate degree in DegreeWorks.

Master of Science in History and Sociology of Technology and Science

The School offers a program of graduate study in the history and sociology of technology and science at both the master's and doctoral

levels. The two-year master's program consists of foundation courses in history, social theory, and research methods, as well as more specialized reading and research seminars. The program emphasizes the understanding of technology and science within a broad social and historical context. Students develop a strong general background in history and sociology, and acquire skills in research, social analysis, and writing. The basic curriculum of thirty credit hours consists of fifteen credit hours of required mandatory courses, plus fifteen credit hours of electives for those who do not wish to proceed to the PhD, or plus nine credit hours of electives and six credit hours of special problems (research paper) for those who wish to proceed to the PhD. The program includes two tracks: a History Track and a Sociology Track.

History Track – Curriculum

Code	Title	Credit Hours
Required Courses		
HTS 6001	Proseminar in Social Theory	3
HTS 6002	Proseminar in the History of Technology	3
Select one of the following:		3
HTS 6101	Social and Political History of the United States	
HTS 6102	Social and Political History of Europe	
HTS 6103	Social and Political History of the Nonwestern World	
HTS 6743	Science, Technology & Soceity: Core Seminar	3
HTS 7001	Foundations of Socio-historical Analysis	3
Electives		
Select five of the following:		15
HTS 6101	Social and Political History of the United States	
HTS 6102	Social and Political History of Europe	
HTS 6103	Social and Political History of the Nonwestern World	
HTS 6106	Business Organizations and Political Economy	
HTS 6110	Gender, Science, and Technology	
HTS 6111	Technology and Modern Culture	
HTS 6112	Studies in Science and Engineering	
HTS 6113	Development, Technology and Science	
HTS 6114	Topics in the History of Science	
HTS 6115	Sociology of Science and Technology	
HTS 6116	The Environment in World History	
HTS 6117	Urbanization	
HTS 6118	Sci Tech and the Economy	
HTS 6119	Race and Ethnicity	
HTS 6120	Inequality, Science and Technology	
HTS 6121	Science, Technology, and National Security	
HTS 6122	History of Medicine	
HTS 6123	Social and Cultural Studies of Biomedicine	
HTS 6124	Science and Technology Beyond Borders	
Total Credit Hours		**30**

Notes

- Students who have taken either HTS 6101, HTS 6102, or HTS 6103 to satisfy their mandatory course requirements may take one or both of the other courses, if they are offered, as an elective.
- As this is a multidisciplinary degree, students in the history track can take electives from the sociology track, with the agreement of their advisor.
- Electives may include no more than 6 credit hours of HTS 890X (Special Problems) or HTS 6801 combined. Students who wish to proceed to the PhD must take at least 3 hours of HTS 6801.
- Electives must include at least 12 credit hours within The School of History and Sociology.

Sociology Track - Curriculum

Code	Title	Credit Hours
Required Courses		
HTS 6001	Proseminar in Social Theory	3
HTS 6002	Proseminar in the History of Technology	3
HTS 6743	Science, Technology & Soceity: Core Seminar	3
HTS 7001	Foundations of Socio-historical Analysis	3
Advanced Sociological Methods [1]		3
Electives		
Select five of the following:		15
HTS 6101	Social and Political History of the United States	
HTS 6102	Social and Political History of Europe	
HTS 6103	Social and Political History of the Nonwestern World	
HTS 6106	Business Organizations and Political Economy	
HTS 6110	Gender, Science, and Technology	
HTS 6111	Technology and Modern Culture	
HTS 6112	Studies in Science and Engineering	
HTS 6113	Development, Technology and Science	
HTS 6114	Topics in the History of Science	
HTS 6115	Sociology of Science and Technology	
HTS 6116	The Environment in World History	
HTS 6117	Urbanization	
HTS 6118	Sci Tech and the Economy	
HTS 6119	Race and Ethnicity	
HTS 6120	Inequality, Science and Technology	
HTS 6121	Science, Technology, and National Security	
HTS 6122	History of Medicine	
HTS 6123	Social and Cultural Studies of Biomedicine	
HTS 6124	Science and Technology Beyond Borders	
Total Credit Hours		**30**

[1] This course is chosen from a wide variety of courses available in other programs on campus and at Georgia State University, in consultation with their advisor.

Notes

- Students may be required to take a second course in Advanced Sociological Methods if required to do so by their advisor.

- As this is a multidisciplinary degree students in the sociology track can take electives from the history track, with the agreement of their advisor.
- Electives may include no more than 6 credit hours of HTS 890X (Special Problems) or HTS 6801 combined. Students who wish to proceed to the PhD must take at least 3 hours of HTS 6801.
- Electives must include at least 12 credit hours within The School of History and Sociology.

Master of Science in Human-Computer Interaction

The interdisciplinary Master of Science in Human-Computer Interaction (HCI) degree program is a cooperative effort of the School of Interactive Computing; the School of Literature, Media and Communication; the School of Industrial Design, and the School of Psychology. The program provides students with the practical *and* interdisciplinary skills and theoretical understanding they will need to become leaders in the design, implementation, and evaluation of the computer interfaces of the future.

Course of Study

The HCI master's degree is a four-semester program consisting of a total of thirty-six credit hours. Each student is required to complete a set of four core courses, a set of elective courses based on their academic background and interests, a set of area specialization courses based on the academic unit in which they reside, and a Master's project. The specific courses for each student will be determined by the HCI program coordinator in consultation with the academic unit. The area specialization courses are determined by the academic unit in which the student resides. The areas of specialization are: Interactive Computing; Digital Media (DM, through the School of Literature, Media and Communication); Industrial Design; and Psychology.

Specialization	Fixed Core Credit Hours	Specialization Credit Hours	Elective Credit Hours	Project Credit Hours
Interactive Computing	9	9	12	6
Digital Media	9	9	12	6
Industrial Design	9	12	9	6
Psychology	9	10	11	6

Each student is required to maintain a 3.0 grade point average across credit hours used to fulfill degree requirements, a minimum grade of "B" in Fixed Core, Specialization, and Project credit hours, and a minimum grade of "C" in Elective credit hours.

Core Courses

Code	Title	Credit Hours
Core Courses		**9**
CS/PSYC 6755	Human-Computer Interaction Foundations [1,2,3]	3
PSYC 6023	Psychological Research Methods for HCI [1,3]	4
CS/ID/LMC/ PSYC 6753	Human-Computer Interaction-Professional Preparation and Practice (one credit hour Fall of first year and one credit hour Fall of second year) [1]	2

1 A minimum grade of "B" is required in each of the Fixed Core classes.

2 Course must be taken during first semester.

3 Students are expected to take PSYC 6755/CS 6755 and PSYC 6023 during the same semester.

Specializations:

Interactive Computing Specialization

Code	Title	Credit Hours
Software		
Select 3 credit hours from the following:		3
CS 6452	Prototyping Interactive Systems	
CS 6456	Principles of User Interface Software	
CS 6457	Video Game Design and Programming	
CS 7450	Information Visualization	
CS 7470	Mobile and Ubiquitous Computing	
CS 7633	Human-Robot Interaction	
CS 8803	Special Topics (Mobile Apps and Services)	
Design-Evaluation-and Cognitive Modeling		
Select 6 credit hours from the following:		6
CS 6150	Computing For Good	
CS 6440	Information to Health Informatics	
CS 6451	Introduction to Human-Centered Computing	
CS 6454	Qualitative Methods for Design of Human Computer Interaction	
CS 6457	Video Game Design and Programming	
CS 6460	Educational Technology: Conceptual Foundations	
CS 6470	Design of Online Communities	
CS 6474	Social Computing	
CS 6730	Data Visualization: Principles and Applications	
CS/INTA 6745	Information and Communication Technologies and Global Development	
CS 6770	Mixed Reality Experience Design	
or LMC 6	Mixed Reality Experience Design	
CS/ID 6763	Design of Design Environments	
CS 6795	Introduction to Cognitive Science	
CS 7450	Information Visualization	
CS 7451	Human-Centered Data Analysis	
CS 7632	Game Artificial Intelligence	
CS 7633	Human-Robot Interaction	
CS 8803	Special Topics (Animal interaction)	
CS 8803	Special Topics (Computational Creativity)	
CS 8803	Special Topics (Personal Health Informatics)	
CS 8803	Special Topics (Physical Prototyping in HCI)	
Total Credit Hours		**9**

A minimum grade of "B" is required in each of the Interactive Computing Specialization classes.

Digital Media (DM) Specialization

Code	Title	Credit Hours
Select one of the following- preferably taken in the first year of study:		3
LMC 6310	The Computer as an "Expressive Medium"	
LMC 6313	Principles of Interaction Design	
LMC 6399	Discovery & Invention	
LMC 6000- or 8000-level courses		6
Total Credit Hours		**9**

A minimum grade of "B" is required in each of the Digital Media Specialization classes.

Industrial Design Specialization

Code	Title	Credit Hours
Required:		
ID 6101	Human Centered Design	3
ID 8802	Special Topics in ID (Visual Communication for Interaction)	2
Select one of the following courses:		4
ID 6212	Grad Studio Two: Health and Wellness	
ID 6213	Grad Studio Two: Interactive Products	
Select one from the following:		3
ID 6100	Introduction to Graduate Studies in Industrial Design	
ID 6216	Service Design, Brand and Value Creation	
ID 6510	Design for Interaction: Working with New Technologies	
ID 6515	Interface Prototyping: Exploring Tools & Theories	
ID 6763	Design of Interactive Environments	
ID 6800	Investigations of Universal Design in the Built Environment	
ID 6820	Web Design, Usability and Accessibility	
ID 8803	Special Topics (Technoology of Poetic Objects)	
ID 8803	Special Topics (Consumer Electronics Design)	
ID 8803	Special Topics (Craft Exploration Methods)	
ID 8803	Special Topics (Wearable Technologies for Health)	
Total Credit Hours		**12**

A minimum grade of "B" is required in each of the Industrial Design Specialization classes.

Psychology Specialization

Code	Title	Credit Hours
Required		
PSYC 6022	Psychological Statistics for HCI (Fall or Spring)	4
Select 6 credit hours from the following:		6
PSYC 6011	Cognitive Psychology	
PSYC 6012	Social Psychology	
PSYC 6013	Biopsychology	
PSYC 6014	Sensation and Perception	
PSYC 6017/4270	Human Abilities [1]	
PSYC 6041	Current Topics in Cognitive Aging	
PSYC 6060/4260	Psychology of Aging	
PSYC 6270/4270	Psychological Testing [2]	
PSYC 7101	Engineering Psychology I: Methods	
PSYC 7102	Engineering Psychology II: Displays, Controls, and Workspace	
PSYC 8000/4050	Seminar in Experimental Psychology	
Total Credit Hours		**10**

1 The pre-requisite to this course is PSYC 2020 or equivalent. Note: PSYC 2020 (Psychological Statistics) is currently equivalent to PSYC 6022 (Psychological Statistics for HCI) which is required for all Psychology specialization students.

2 The pre-requisite to this course is PSYC 2020 or equivalent. Note: PSYC 2020 (Psychological Statistics) is currently equivalent to PSYC 6022 (Psychological Statistics for HCI) which is required for all Psychology specialization students.

A minimum grade of "B" is required in each of the Psychology Specialization classes.

Elective Courses:

- 12 credit hours for Interactive Computing
- 12 credit hours for Digital Media
- 9 credit hours for Industrial Design
- 11 credit hours for Psychology

Any Specialization course may be taken to fulfill an Elective course requirement for any of the four degree tracks. Other approved Electives appear in the list below.

For each area of specialization (track), a certain number of Elective credits must be taken outside of the area:

- Interactive Computing: at least 9 non-CS elective credits must be taken
- Industrial Design, Digital Media, and Psychology: at least 6 non-track elective credits must be taken

A maximum of 3 credit hours of Special Problems in HCI (CS/ID/LMC/PSYC 8903) may count toward the Elective course requirement.

A minimum grade of "C" is required in each of the Elective classes used to satisfy degree requirements.

Aerospace Engineering

Code	Title	Credit Hours
AE 6551	Cognitive Engineering	3
AE 6721	Evaluation of Human Integrated Systems	3

Computer Science(NOTE: These courses are still approved electives, but they have been combined with the next section to create a single list of approved Computer Science courses).

Code	Title	Credit Hours
CS 6150	Computing For Good	3
CS 6440	Information to Health Informatics	3
CS 6451	Introduction to Human-Centered Computing	3
CS 6452	Prototyping Interactive Systems	3
CS 6454	Qualitative Methods for Design of Human Computer Interaction	3
CS 6456	Principles of User Interface Software	3
CS 6457	Video Game Design and Programming	3
CS 6460	Educational Technology: Conceptual Foundations	3
CS 6465	Computational Journalism	3
CS 6470	Design of Online Communities	3
CS 6474	Social Computing	3
CS 6730	Data Visualization: Principles and Applications	3
CS/INTA 6745	Information and Communication Technologies and Global Development	3
CS/ID 6763	Design of Design Environments	3
CS 6770	Mixed Reality Experience Design	3
or LMC 6340	Mixed Reality Experience Design	
CS 6795	Introduction to Cognitive Science	3
CS 7450	Information Visualization	3
CS 7451	Human-Centered Data Analysis	3
CS 7470	Mobile and Ubiquitous Computing	3
CS 7497	Virtual Environments	3
CS 7632	Game Artificial Intelligence	3
CS 7633	Human-Robot Interaction	3
CS 8803	Special Topics (Animal Interaction)	3
CS 8803	Special Topics (Computational Creativity)	3
CS 8803	Special Topics (Personal Health Informatics)	3
CS 8803	Special Topics (Mobile Apps and Services)	3
CS 8803	Special Topics (Physical Prototpying in HCI)	3
CS 8903	Special Problems	1-21

International Affairs

Code	Title	Credit Hours
INTA 8803	Special Topics (Computers, Communications, and International Development)	3
INTA/CS 6745	Information and Communication Technologies and Global Development	3

Industrial Design

Code	Title	Credit Hours
ID 6100	Introduction to Graduate Studies in Industrial Design	3
ID 6101	Human Centered Design	3
ID 6212	Grad Studio Two: Health and Wellness	4
ID 6213	Grad Studio Two: Interactive Products	4
ID 6216	Service Design, Brand and Value Creation	3
ID 6510	Design for Interaction: Working with New Technologies	3
ID 6515	Interface Prototyping: Exploring Tools & Theories	3
ID 6271	Healthcare Design of the Future	3
ID/CS 6763	Design of Interactive Environments	3
ID 6800	Investigations of Universal Design in the Built Environment	3
ID 6820	Web Design, Usability and Accessibility	3
ID 8802	Special Topics in ID (Visual Communication for Interaction)	2
ID 8803	Special Topics (Technology of Poetic Objects)	3
ID 8803	Special Topics (Wearable Technologies for Health)	3
ID 8803	Special Topics (Craft Exploration Methods)	3
ID 8803	Special Topics (Consumer Electronics Design)	3
ID 8903	Special Problems in Human-Computer Interaction	1-3

Industrial and Systems Engineering

Code	Title	Credit Hours
ISYE 6413	Design and Analysis of Experiments	3
ISYE 6414	Statistical Modeling and Regression Analysis	3
ISYE 6739	Basic Statistical Methods	3
ISYE 6772	Managing Resources of the Technological Firm	3
ISYE 7210	Real-time Interactive Simulation	3

Literature, Media, and Communication (Digital Media)

Code	Title	Credit Hours
LMC 6215	Issues in Media Studies	3
LMC 6310	The Computer as an "Expressive Medium"	3
LMC 6311	Visual Culture and Design	3
LMC 6312	Design, Technology & Representation	3
LMC 6313	Principles of Interaction Design	3
LMC 6314	Design of Networked Media	3
LMC 6315	Product Production	3
LMC 6316	Historical Approaches to Digital Media	3
LMC 6317	Interactive Narrative/Fiction	3
LMC 6318	Experimental Media	3
LMC 6319	Intellectural Property Policy and Law	3
LMC 6325	Game Design and Analysis	3
LMC 6340/ CS 6770	Mixed Reality Experience Design	3
LMC 6399	Discovery & Invention	3
LMC 6650	Project Studio	3
LMC 6748	Social Justice, Critical Theory, and Philosophy of Design	3
LMC 8000	Proseminar in Media Theory	3
LMC 8001	Proseminar in Digital Media Studies	3

LMC 8903	Special Problems in Human-Computer Interaction	3

Management of Technology (MOT)

Code	Title	Credit Hours
MGT 6056	Electronic Commerce-Conducting Business on the Internet	3
MGT 6057	Business Process Analysis and Design	3
MGT 6059	Emerging Technologies	3
MGT 6086	Entrepreneurial Finance and Private Equity	3
MGT 6111	Innovation and Entrepreneurial Behavior	3
MGT 6165	Venture Creation	3
MGT 6326	Collaborative Product Development	3
MGT 6359	Business Strategies For Sustainability	3
MGT 6450	Project Management	3
MGT 6772	Managing Resources of the Technological Firm	3
MGT 6799	Legal Issues in Technology Transfer	3
MGT 6789	Technology Ventures	3
MGT 8803	Big Data Analytics in Business	3

Music

Code	Title	Credit Hours
MUSI 6001	Music Perception and Cognition	3
MUSI 6002	Computer Supported Interactive Music	3
MUSI 6003	Music Technology History and Repertoire	3
MUSI 6004	Technology Ensemble	3
MUSI 6103	Music Recording and Mixing	3
MUSI 6203	Project Studio in Music Technology	3
MUSI 7100	Music Technology Research Laboratory	3

Psychology

Code	Title	Credit Hours
PSYC 6011	Cognitive Psychology	3
PSYC 6012	Social Psychology	3
PSYC 6014	Sensation and Perception	3
PSYC 6022	Psychological Statistics for HCI	4
PSYC 6041	Current Topics in Cognitive Aging	1
PSYC 7101	Engineering Psychology I: Methods	3
PSYC 7102	Engineering Psychology II: Displays, Controls, and Workspace	3
PSYC 7104	Psychomotor and Cognitive Skill Learning and Performance	3
PSYC/CS 7790	Cognitive Modeling	4
PSYC 8040	Seminar in Engineering Psychology	3
PSYC 8903	Special Problems in Human-Computer Interaction	3

Public Policy

Code	Title	Credit Hours
PUBP 6111	Internet and Public Policy	3
PUBP 6401	Science, Technology, and Public Policy	3

Research Project (6 credit hours)

Each student completes this requirement, under the supervision of a faculty member, typically during the last two semesters of their program. Students must submit a project proposal and a final report and present their work to program coordinators and other MS - HCI students late during the semester of graduation.

Code	Title	Credit Hours
Select one of the folloiwng:		
CS 6998	HCI Master's Project [1]	
LMC 6998	HCI Master's Project [1]	
PSYC 6998	HCI Master's Project [1]	
ID 6998	HCI Master's Project [1]	

[1] repeatable; up to 6 credits

A minimum grade of “B” is required in the project course.

Other expectations

All students are expected to complete a corporate internship in an HCI-relevant position between their second and third semesters.

Master of Industrial Design (MID)

Industrial design is the professional service of creating and developing concepts and specifications that optimize the function, value, and appearance of products and systems for the mutual benefit of both user and manufacturer. The industrial designer's work touches all of our lives in the form of home products and furnishings, communication devices, healthcare equipment, rehabilitation technologies, and a myriad of other consumer and industrial products and services. While giving form to the efforts of industry, the designer is at the same time a consumer advocate, providing the humanizing link between technology and people. As such, the industrial designer's central responsibilities include fitting the artifact, system, or service to the person through considering appropriate aesthetics and ergonomics, technical processes, requirements for manufacture, marketing opportunities, and economic constraints.

At the graduate-level, Georgia Tech's Master's of Industrial Design (MID) focuses on an inclusive design approach that is dedicated to the creation and development of products, systems, services and environments that are usable by all segments of the population. With the growing diversity of the population, inclusive design is becoming increasingly important to designers of tomorrow to ensure that design is responsive to the individual and collective needs of all people.

Capitalizing on Georgia Tech's rich traditions in technology and research, the MID program stresses a user-centered design process and evidence-based design practice that offers students unique opportunities to explore the design of new and existing technologies. Faculty members, who are practicing designers and experts in their fields, maintain active research programs in tangible products within communication technologies, enabling environments, supportive product systems, rehabilitation technologies, and healthcare systems technologies.

The Georgia Tech MID program offers a well-rounded course of study with early emphasis on exercising design principles and developing project-based design skills. Design projects stress realistic design situations, where students can have the opportunity to be involved in sponsored and/or funded projects. Within this model, the program encourages students to expand individual disciplinary talents and respond to changing opportunities in the field.

Students who have an undergraduate degree in industrial design from an undergraduate ID program similar to Georgia Tech's can complete a two-year program consisting of 48 graduate credits.

Students who do not have an undergraduate degree in industrial design will need to successfully complete an additional 28 undergraduate industrial design credits, which at a minimum includes one year of undergraduate industrial design studios, Advanced Sketching, History of Industrial Design, Industrial Design Computing I and II, and Professional ID Practices. These classes are the minimum requirements students with a previous degree other than industrial design need before proceeding into the graduate-level studios and coursework.

All graduate students will be reviewed each year for satisfactory progress. Credit toward the MID degree will be granted for courses in which a grade of C or higher is earned.

ID Graduate Studies Information

The minimum requirements for the two-year MID degree for a student with a previous degree in industrial design are as follows:

Code	Title	Credit Hours
Required Courses		
ID 6100	Introduction to Graduate Studies in Industrial Design	3
ID 6101	Human Centered Design	3
ID 6211	Graduate Studio One	4
ID 6216	Service Design, Brand and Value Creation	3
ID 6403	Intro to Thesis Studies	3
Select one:		4
ID 6212	Grad Studio Two: Health and Wellness	
ID 6213	Grad Studio Two: Interactive Products	
Graduate Electives		**16**
ID 6106	3D Design Methods	
ID 6109	Human Factors and Ergonomics	
ID 6401	Visualizing Interaction	
ID 6420	Advanced Sketching	
ID 6508	Shape Grammars	
ID 6506	Parametric Product Modeling	
ID 6509	Computation, Creativity and Design Cognition	
ID 6510	Design for Interaction: Working with New Technologies	
ID 6515	Interface Prototyping: Exploring Tools & Theories	
ID 6520	Crafting Design Methods	
ID 6620	Soft Goods Design	
ID 6763	Design of Interactive Environments	
ID 6800	Investigations of Universal Design in the Built Environment	
ID 6820	Web Design, Usability and Accessibility	
ID 6830	Wearable Tech for Health	
ID 7655	Designing For Curiosity	
ID 8803	Special Topics (Advance Immersive Experiences)	
ID 8803	Special Topics (Evidence Based Design)	
ID 8803	Special Topics (CoDe Craft Group)	
ID 8803	Special Topics (Culture of Objects)	
ID 8803	Special Topics (Game Play User Experience)	
ID 8803	Special Topics (Health Care Design of the Future)	
ID 8803	Special Topics (Professional Practices)	
ID 8803	Special Topics (HMI Lab UX Interior Project)	
ID 8803	Special Topics (Tech of Poetic Objects)	
Thesis/Non-Thesis		
Select one of the following:		12
ID 7000	Master's Thesis	
ID 6400	Master's Project (Non-Thesis)	
Total Credit Hours		**48**

All work executed in the College becomes the property of the College and will be retained or returned at the discretion of the faculty. The faculty also reserves the right to refuse credit for any project executed outside the precincts of the College or otherwise executed without proper coordination with the instructor.

Master of Science in Industrial Engineering

The School of Industrial and Systems Engineering (ISYE) offers eight master's degrees:

- Master of Science in Industrial Engineering (MS IE);
- Master of Science in Operations Research (MS OR);
- Master of Science in Supply Chain Engineering (MS SCE);
- Master of Science in Statistics (MS STAT);
- Master of Science in Health Systems (MS HS);
- Master of Science in Quantitative and Computational Finance (MS QCF);
- Master of Science in International Logistics (MS IL) that is part of the executive program; and
- Master of Science in Computational Science and Engineering (MS CSE).

Three of these programs are interdisciplinary:

- MS QCF (joint with School of Mathematics, College of Business),
- MS STAT (joint with School of Mathematics) and
- MS SCE (joint with College of Computing, School of Mathematics).

All proposed master's degree programs require thirty semester credit hours with the exception of MS IL and MS QCF (thirty-six credit hours) and MS HS (thirty-three credit hours). None of these MS programs contains a thesis option.

A student seeking a master's degree must have a bachelor's degree and typically one earned in engineering, science, mathematics, or some other field that provides an adequate background for the successful

completion of one of ISyE's programs. Students having backgrounds from unaccredited degree programs or in programs that are found lacking in relative substance can expect to first take preliminary coursework in order to elevate their preparation to the level required. The prerequisite coursework for the various master's degrees includes strong performance in probability, statistics, linear algebra, and calculus.

Every MS curriculum is based on core classes offered from the School of ISyE, as well as electives offered by ISyE and other Georgia Tech schools in engineering and science. The MS SCE, MS QCF, and MS IL are professional degree programs with separate curriculums from the other regular MS degrees.

MS Human-Integrated Systems

Program Requirements

Code	Title	Credit Hours
Core		
ISYE 6201	Manufacturing Systems	3
ISYE 6202	Warehousing Systems	3
ISYE 6203	Transportation and Supply Chain Systems	3
Breadth (Choose 3):		**9**
ISYE 6225	Advanced Engineering Economy	
or ISYE 6	Introduction to Financial Engineering	
ISYE 6414	Statistical Modeling and Regression Analysis	
ISYE 6644	Simulation	
ISYE 6650	Probabilistic Models and Their Applications	
ISYE 6669	Deterministic Optimization	
Technical Electives (Choose 2)		**6**
ISYE 6225	Advanced Engineering Economy	
ISYE 6230	Economic Decision Analysis	
ISYE 6307	Scheduling Theory	
ISYE 6320	Public Impact Applications of Operations Research and Management Science	
ISYE 6402	Time Series Analysis	
ISYE 6404	Nonparametric Data Analysis	
ISYE 6405	Statistical Methods for Manufacturing Design and Improvement	
ISYE 6413	Design and Analysis of Experiments	
ISYE 6414	Statistical Modeling and Regression Analysis	
ISYE 6416	Computational Statistics	
ISYE 6420	Introduction to Theory and Practice of Bayesian Statistics	
ISYE 6421	Biostatistics	
ISYE 6650	Probabilistic Models and Their Applications	
ISYE 6661	Linear Optimization	
ISYE 6662	Discrete Optimization	
ISYE 6663	Nonlinear Optimization	
ISYE 6664	Stochastic Optimization	
ISYE 6669	Deterministic Optimization	
ISYE 6679	Computational Methods in Optimization	
ISYE 6701	Energy Technology and Policy	
ISYE 6740	Computational Data Analysis: Learning, Mining, and Computation	
ISYE 6761	Stochastic Processes I	
ISYE 6762	Stochastic Processes II	
ISYE 6805	Reliability Engineering	
ISYE 6810	Systems Monitoring and Prognostics	
ISYE 6832	Simulation Theory and Methods	
ISYE 7406	Data Mining and Statistical Learning	
Free Electives (Choose 2)		**6**
6000-level or higher courses [1]		
Total Credit Hours		**30**

Up to six (6) credits of 4000-level courses may be used towards the degree, subject to the approval of the ISyE Director of Master's Programs.

[1] ISYE 6739 is not allowed to count toward Free Electives

Practicum Track Requirements

Code	Title	Credit Hours
Core		
ISYE 6201	Manufacturing Systems	3
ISYE 6202	Warehousing Systems	3
ISYE 6203	Transportation and Supply Chain Systems	3
Breadth (Choose 3):		**9**
ISYE 6225	Advanced Engineering Economy	
or ISYE 6	Introduction to Financial Engineering	
ISYE 6414	Statistical Modeling and Regression Analysis	
ISYE 6650	Probabilistic Models and Their Applications	
ISYE 6669	Deterministic Optimization	
Technical Electives (Choose 2)		**6**
ISYE 6225	Advanced Engineering Economy	
ISYE 6307	Scheduling Theory	
ISYE 6320	Public Impact Applications of Operations Research and Management Science	
ISYE 6402	Time Series Analysis	
ISYE 6404	Nonparametric Data Analysis	
ISYE 6405	Statistical Methods for Manufacturing Design and Improvement	
ISYE 6413	Design and Analysis of Experiments	
ISYE 6414	Statistical Modeling and Regression Analysis	
ISYE 6416	Computational Statistics	
ISYE 6420	Introduction to Theory and Practice of Bayesian Statistics	
ISYE 6421	Biostatistics	
ISYE 6644	Simulation	
ISYE 6650	Probabilistic Models and Their Applications	
ISYE 6661	Linear Optimization	
ISYE 6662	Discrete Optimization	
ISYE 6663	Nonlinear Optimization	
ISYE 6664	Stochastic Optimization	
ISYE 6669	Deterministic Optimization	
ISYE 6679	Computational Methods in Optimization	
ISYE 6701	Energy Technology and Policy	
ISYE 6740	Computational Data Analysis: Learning, Mining, and Computation	
ISYE 6761	Stochastic Processes I	

ISYE 6762	Stochastic Processes II	
ISYE 6805	Reliability Engineering	
ISYE 6810	Systems Monitoring and Prognostics	
ISYE 6832	Simulation Theory and Methods	
ISYE 7406	Data Mining and Statistical Learning	
Free Electives (Choose 1)		**3**
6000-level or higher courses [1]		
Internship Preparation Elective [2]		**3**
ISYE 6320	Public Impact Applications of Operations Research and Management Science	
or ISYE 6644	Simulation	
ISYE 6701	Energy Technology and Policy	
Practicum		
COOP/INTN/ISYE Practicum		
Total Credit Hours		**30**

Up to six (6) credits of 4000-level courses may be used towards the degree, subject to approval of the ISyE Director of Master's Programs.

[1] ISYE 6739 is not allowed to count as a Free Elective
[2] ISYE Special Topics courses, as appropriate

BS/MS Option

The BSMS Option allows eligible students to double count a maximum of 6 credit hours toward undergraduate and graduate requirements while still completing all other program requirements to earn both degrees.

BS in Industrial Engineering students with a GPA of 3.5 or higher who have taken ISYE 3133 and ISYE 3232 are eligible to apply to utilize the BSMS Option. BSIE students must also graduate with a GPA of 3.5 or higher in order to utilize the BSMS Option.

It is typical for students to use 6 hours from the BSIE concentration electives to count as Core Courses or Technical Electives for the MSIE degree. Students will need to consult with an advisor to indicate which courses are sharing with the graduate degree in DegreeWorks.

Master of Science in International Affairs

The study of international affairs emerged in the 20th Century to increase global cooperation among states, subnational parties, and international organizations. In the 21st Century, studying international affairs is more important than ever because we live in a world that is experiencing an explosion of technology, rapidly shrinking, and more interconnected. The Master of Science in International Affairs (MS INTA) focuses on equipping students for 21st Century careers to address these growing issues.

The MS INTA degree program is a two-year program designed to be adaptable to the interests and needs of students who intend to immediately enter professional careers requiring advanced training or who plan to continue studying at the doctoral level. The program emphasizes both traditional theoretical knowledge of international relations and strategic planning and analysis.

Students are also required to choose two tracks in which to concentrate their studies by selecting two electives in each track.

Click here for the School's information page.

The program includes core courses in the following:

- International relations theory
- Comparative politics
- International political economy
- International security
- Empirical research methods

Students must also choose two of four elective tracks to in order to focus their studies. The four track options are:

- Comparative and Regional Studies
- Globalization and Development
- International Affairs and Security
- Science and Technology

Students also have the opportunity to design the program to meet their individual interests through elective offerings in the School and interdisciplinary work in the other schools in the Ivan Allen College as well as the Colleges of Sciences, Management, Architecture and Engineering. Overseas programs and internships are encouraged and facilitated by the School.

Three (3) credit hours of technology literacy is required and is satisfied by successfully completing (B or higher) at least one semester of classes with content including at least one of the following while in the Master's program:

- programming computers;
- database design and operation;
- development and operation;
- data analysis (if part of statistics courses, at least two quarters or two semesters);
- simulation model design and use;
- development and use of geographic information or cartography systems; or
- operation of large computer systems/ computer networks.

In addition to 42 semester credit hours of coursework, students must demonstrate foreign language familiarity and economics. These abilities are essential tools for professional or scholarly work in international affairs. Students must satisfy these requirements before graduating from the program, either through previous undergraduate work or during the Master's program.

Foreign language familiarity is defined as a minimum of two years of college-level work in a single language. This requirement can be fulfilled while in residence or can be demonstrated through an examination taken in the School of Modern Languages.

Economics literacy is satisfied by successful completion of a course or courses in microeconomic and macroeconomic principles and a course in international economics undertaken while at Georgia Tech, or by successful completion of equivalent courses at another institution, either during undergraduate work or while in the Master's program.

The School's master's degree requirements supplement the Institute's master's degree requirements listed in the General Catalog. Students must achieve a grade-point average of at least 3.0 to graduate, and no course below grade C will count toward graduation.

Master of Science in International Affairs, Science, and Technology

The Sam Nunn School of International Affairs offers a single-year, 30-credit hours Master of Science in International Affairs, Science, and Technology (MS IAST). The MS IAST program offers students the conceptual foundations and practical policy analysis of issues at the intersection of international politics, science, and technology. With increasing concerns about a globalizing international environment and the ability to address emerging technological and political challenges, this master's degree is timely.

Students will be exposed to issues related to energy, the environment, information and communication technologies, space policy, disruptive technologies, intelligence, arms control, and other contemporary issues. These substantive areas reflect ongoing, evolving, and emerging technological trends currently facing policy makers, technologists, innovators, analysts, non-governmental organizations, the military, local populations, and other relevant actors.

Code	Title	Credit Hours
Core Requirements		
INTA 6102	International Relations Theory	3
INTA 6003	Empirical Research Methods	3
INTA 8000	Seminar in Science, Technology and International Affairs I	3
INTA 8001	Seminar in Science, Technology and International Affairs II	3
International Affairs, Science and Technology Electives		**9**
INTA 6002	Strategic Decision Making	
INTA 6004	Modeling, Forecasting, and Decision Making	
INTA 6011	International Trade and Technology Transfer	
INTA 6014	Scenario Writing and Path Gaming	
INTA 6015	Technology and Military Organizations	
INTA 6016	Strategy and Arms Control	
INTA 6304	Modernization and Development	
INTA 6740	Innovation, the State and Industrial Development in International Perspective	
INTA 6742	Modeling, Simulation and Military Gaming	
INTA 6745	Information and Communication Technologies and Global Development	
INTA 6753	Comparative Science and Technology Policy	
INTA 8803	Special Topics (Space Policy)	
INTA 8803	Special Topics (International Affairs and Technology Policy)	
INTA 8803	Special Topics (Networks, Infrastructure, and Security)	
INTA 8803	Special Topics (The Problem of Proliferation)	
INTA 8803	Special Topics (Intelligence and International Security)	
INTA 8803	Special Topics (Big Data and Security)	
INTA 8803	Special Topics (Data Analysis and Visualization)	
INTA 8803	Special Topics (Energy and International Security)	
INTA 8803	Special Topics (Environmental Politics)	
INTA 8803	Special Topics (Transatlantic Relations)	
Free Electives [1]		**9**
Total Credit Hours		**30**

[1] 6000-8000-level courses

Master of Science in International Security

The single-year Master of Science in International Security (MS ISEC) offers students the opportunity to understand conceptual foundations and practical policy analysis of issues related to international security. The curriculum allows students to customize their program of study among a diverse set of subjects — including 21st-century great power rivalry; defense policy analysis and military strategy; crisis decision-making; comparative forms of statecraft; transnational terrorism; peacekeeping; regional security; geopolitics of energy; cross-cultural bargaining and negotiations; and cyber warfare. In addition to exposure to qualitative and quantitative research methods, students can acquire proficiency with tools such as data and visual analytics and modeling and simulation—in understanding ongoing international security challenges.

A 30-credit hour course load prepares graduates with the substantive knowledge and skills to distill, assess, and communicate the drivers and strategic consequences associated with emerging global security problems as experts and leaders in foreign and security policymaking, defense planning, the intelligence community, non-governmental organizations, and the private sector. The International Security program is part of the Nunn School's mission of developing global policymakers for the 21st Century.

Program information on the School website

Master of Science in International Security objectives:

- Problem solving in international security. Students will be able to use their knowledge of international security in a practical problem-solving way to address issues of immediate and future international concern. This includes knowledge of key substantive issues, familiarity with research methods to analyze and evaluate solutions, research and data collection skills to facilitate the implementation of the aforementioned methodological tools.
- Scientific analysis of international security politics. Students will be proficient in basic analytical skills and be able to formulate and scrutinize problems in international affairs, quantitatively or qualitatively, whichever is appropriate. This will also include the ability to use and implement software, process and analyze information, and deploy quantitative and qualitative methodologies.
- Professional development. Students will be able to think strategically about their career choices and to identify appropriate avenues for preparing themselves to pursue them; express their arguments clearly and effectively both in written analyses and through oral presentations; and work in small groups in a way that demonstrates respect for their colleagues and efficiency in working collaboratively towards projects and goals.

Code	Title	Credit Hours
Required courses		
INTA 6003	Empirical Research Methods	3
INTA 6102	International Relations Theory	3
INTA 6103	International Security	3
Electives		
INTA 6000-, 8000-level Specialization courses		12
Free electives (6000-,8000-level)		9
Total Credit Hours		**30**

Master of Science with a Major in Management

The undesignated Master of Science degree program serves students whose educational and career goals may not be best served by the MBA program. Under these circumstances, the student may pursue a specially tailored master's-level curriculum that satisfies the American Assembly of Collegiate Schools of Business (AACSB) common body of knowledge requirements and provides a coherent concentration of elective courses chosen in consultation with an academic advisor. This specialized degree program is designed primarily for students who are admitted to Georgia Tech in approved foreign education programs, but may also be completed by students in the PhD program who are unable to complete the full doctoral degree. Admission to this program must be approved by the MBA Admissions Committee prior to enrollment.

Master of Science in Materials Science and Engineering

The School of Materials Science and Engineering provides an array of options to both the Undergraduate and Graduate students. The Graduate degrees offered include a MS in Materials Science and Engineering with three program options (thesis, non-thesis, and industrial internship).

MS MSE Information

Non-Thesis Option

Code	Title	Credit Hours
Materials Science and Engineering Approved Electives		**18**
Electives		**12**
Total Credit Hours		**30**

1. Students must complete at least 24 hours of at least 6000-level or higher courses (a maximum of 6 hours of 4000-level courses may be applied).
2. Non-thesis students may take a Special Problems course (MSE 8903) for research experience.

Thesis Option

Code	Title	Credit Hours
Materials Science and Engineering Approved Electives		**12**
Electives		**12**
MSE 7000	**Master's Thesis**	**6**
Total Credit Hours		**30**

1. Students must complete at least 12 hours of at least 6000-level or higher courses (a maximum of 6 hours of 4000-level courses may be applied).

Other Master of Science in Materials Science and Engineering requirements

Code	Title	Credit Hours
MSE 8801	Special Topics (Seminar)	1
Responsible Conduct of Research (Online CITI, if Thesis option)		
Safety Seminar and MSE Safety Exam		

Materials Science and Engineering Approved Electives list

Code	Title	Credit Hours
MSE 6010	Fundamentals of Functional Materials	3
MSE 6105	Diffraction Studies	3
MSE 6110	Transmission Electron Microscopy	3
MSE 6120	Quantitative Characterization of Microstructures	3
MSE 6130	Surface Analysis	3
MSE 6403	Kinetics of Phase Transformations	3
MSE 6404	Scattering Theory	3
MSE 6405	Advanced Nanomaterials	3
MSE 6406	Corrosion of Materials	4
MSE 6407	Biological Properties	3
MSE 6510	Polymers for Electronic and Photonic Applications I	3
MSE 6600	Advanced Polymer Processing	3
MSE 6602	Tensor Analysis and Mathematical Techniques for Materials	3
MSE 6603	Natural Polymers	3
MSE 6750	Preparation & Reactions of Polymers	3
MSE 6751	Physical Chemistry of Polymer Solutions	3
MSE 6752	Polymer Characterization	4
MSE 6755	Theoretical Chemistry of Polymers	3
MSE 6768	Polymer Structure, Physical Properties, and Characterization	3
MSE 6774	Biomaterials: Structure and Function	3
MSE 6776	Integrated Low-cost Microelectronics Systems Packaging	3
MSE 6777	Advanced Biomaterials	3
MSE 6795	Mathematical, Statistical, and Computational Techniques in Materials Science	3
MSE 6796	Structure-Property Relationships in Materials	3
MSE 7140	Impedance and Dielectric Spectroscopy	3
MSE 7210	Dislocation and Deformation Mechanics	3
MSE 7420	Solidification Processing	3
MSE 7771	Mechanics of Polymer Solids and Fluids	3
MSE 7772	Fundamentals of Fracture Mechanics	3

MSE 7774	Fatigue of Materials and Structures	3
MSE 8803	Special Topics (Nanomaterials and Nanotechnology)	3
MSE 8803	Special Topics (Advanced X-Ray Diffraction)	3
MSE 8803	Special Topics (Materials for Energy Storage and Conversion)	3
MSE 8803	Special Topics (Fundamentals of Nanomaterials & Energy)	3
MSE 8803	Special Topics (Biomaterials Properties)	3
MSE 8903	Special Problems	1-21
ME 6104	Computer-Aided Design	3
ME 6124	Finite-Element Method: Theory and Practice	3
ISYE 6739	Basic Statistical Methods	3
BMED 6710	Rational Design of Biomaterials	3
CHEM 6172	Physical Methods in Inorganic Chemistry	3
CHEM 6181	Chemical Crystallography	3
CHEM 6283	Electroanalytical Chemistry	3
CHEM 6382	Computational Methods in Organic Chemistry and Biochemistry	3
CHEM 6752	Polymer Characterization	4
CHEM 6572	Macromolecular Structure	3
MATH 4347	Partial Differential Equations I	3
MATH 4348	Partial Differential Equations II	3
MATH 4255	Monte Carlo Methods	3

Teaching Assignments (TA) Requirements Policy

Teaching assignments are considered to be part of the graduate educational process, as it contributes to training graduate students as academics and in research; consequently, all graduate students (GRA) are required to participate in TA activities.

BS/MS Option

The School of Materials Science and Engineering (MSE) offers a BS/MS program for outstanding students who want to obtain a graduate degree in addition to their BS degree. The advanced degree provides the additional knowledge and specialization needed to further facilitate a technical career. As a participant in this program, students have an opportunity to work with individual faculty members on projects in one of the traditional or innovative research areas in MSE. See www.mse.gatech.edu for more details.

Master of Science in Mathematics

The School of Mathematics provides opportunities for study in a wide range of mathematical disciplines. First-year graduate sequences include algebra, analysis, differential equations, geometry, numerical analysis, probability, quantitative finance, statistics, and topology in addition to courses in methods of applied mathematics.

MS Mathematics Information

A program of study leading to a master's degree in mathematics consists of 30 credit hours and must include at least twelve credit hours at the 6000 level or above in mathematics, with courses in at least three different fields of Mathematics, as follows.

Students must maintain an overall grade-point average of at least 2.7 and receive a grade of **C** or better in each mathematics course in the program of study.

Non-thesis Option

Classes at 3000-level or below, MATH 6701, and MATH 6702 cannot be used to fulfill the degree requirements.

Code	Title	Credit Hours
Analysis Concentration		
Select at least two of the following: [1,2]		6
MATH 6321	Functions of a Complex Variable I	
MATH 6337	Real Analysis I	
MATH 6338	Real Analysis II	
MATH 6580	Introduction to Hilbert Spaces	
MATH 7334	Operator Theory	
MATH 7337	Harmonic Analysis	
MATH 7338	Functional Analysis	
Areas		
Select at least one class in two areas. [2]		6
Non-Thesis Option		
MATH 6000-level or higher [2]		6
Free Electives [3]		12
Total Credit Hours		**30**

1. One of these two classes must be MATH 6337 or MATH 6338
2. Minimum grade of **B** or better required.
3. 9 credits of free electives at 4000-level or above, and additional 3 credits of 6000-level coursework

Thesis Option

Classes at 3000-level or below, MATH 6701, and MATH 6702 cannot be used to fulfill the degree requirements.

Code	Title	Credit Hours
Analysis Concentration		
Select at least two of the following: [1,2]		6
MATH 6321	Functions of a Complex Variable I	
MATH 6337	Real Analysis I	
MATH 6338	Real Analysis II	
MATH 6580	Introduction to Hilbert Spaces	
MATH 7334	Operator Theory	
MATH 7337	Harmonic Analysis	
MATH 7338	Functional Analysis	
Areas		
Select at least one class in two areas. [2]		6
Thesis		
MATH 9000	Doctoral Thesis	9
Additional 4000-level or higher Coursework		9
Total Credit Hours		**30**

1. One of these two classes must be MATH 6337 or MATH 6338

[2] Minimum grade of **B** or better required.

Discrete Mathematics and Algebra

Code	Title	Credit Hours
MATH 6014	Graph Theory and Combinatorial Structures	3
MATH 6121	Modern Abstract Algebra I	3
MATH 6122	Modern Abstract Algebra II	3
MATH 7016	Combinatorics	3
MATH 7018	Probabilistic Methods in Combinatorics	3

Geometry and Topology

Code	Title	Credit Hours
MATH 6441	Algebraic Topology I	3
MATH 6442	Algebraic Topology II	3
MATH 6455	Differential Geometry I	3
MATH 6456	Differential Geometry II	3
MATH 6457	Geometry and Topology I	3
MATH 6458	Introduction to Geometry and Topology II	3

Differential Equations

Code	Title	Credit Hours
MATH 6307	Ordinary Differential Equations I	3
MATH 6308	Ordinary Differential Equations II	3
MATH 6341	Partial Differential Equations I	3
MATH 6342	Partial Differential Equations II	3

Probability and Mathematical Statistics

Code	Title	Credit Hours
MATH 6241	Probability I	3
MATH 6242	Probability II	3
MATH 7244	Stochastic Processes and Stochastic Calculus I	3
MATH 7245	Stochastic Processes and Stochastic Calculus II	3
MATH 6262	Advanced Statistical Inference I	3
MATH 6263	Testing Statistical Hypotheses	3
MATH 6266	Linear Statistical Models	3
MATH 6267	Multivariate Statistical Analysis	3

Numerical Analysis

Code	Title	Credit Hours
MATH 6640	Introduction to Numerical Methods for Partial Differential Equations	3
MATH 6643	Numerical Linear Algebra	3
MATH 6644	Iterative Methods for Systems of Equations	3
MATH 6645	Numerical Approximation Theory	3
MATH 6646	Numerical Methods for Ordinary Differential Equations	3

College of Sciences B.S. in Mathematics + M.S. Degree Program in Mathematics

The Georgia Tech College of Sciences BS/MS degree program enables highly motivated students with strong academic credentials to earn a Bachelor of Science in Mathematics and a Master of Science in Mathematics. The BS/MS program prepares students for competitive career placements with higher earning potentials as well as competitive admission to Ph.D. and professional programs (including medical/law/pharmacy/dental/pharmacy schools). Thesis and non-thesis options are offered for the BS/MS program. Undergraduates with a significant amount of AP/IB/dual enrollment credits are highly encouraged to apply to the BS/MS program.

Admission and Program Requirements:

1. To apply to the program, students must have at least 30 credit hours earned at Georgia Tech with an undergraduate GPA of 3.3 or higher, and fewer than 90 credit hours overall (including transfer credit).

2. If admitted to the B.S./M.S. program, students must complete six credit hours of MATH coursework, with grades of B or higher, that can be used to fulfil the BS and MS requirements, except seminar, reading or research coursework. This coursework must be completed prior to earning the B.S. degree and proceeding to the M.S. program. These credits will be counted towards both the BS degree and MS degree. Due to the flexibility in selection of courses that may count for the BS and MS degree, MATH academic advisors will communicate with the Degree Certification Team in the Registrar's Office regarding which specific courses (i.e. six credits) are double counted for the BS and MS. This step will assure that degree audits are completed correctly

3. Students considering the M.S. Thesis Option are strongly encouraged to begin undergraduate research early in their B.S. program of study. The student must identify the M.S. thesis advisor prior to completion of the B,S, degree and proceeding to the M.S. program. Research described in an undergraduate thesis submitted as a part of the B.S. Research Option cannot be used in the M.S. thesis.

4. The minimum GPA for graduation with a B.S. in Mathematics to continue to the M.S. program is 3.00. The minimum GPA for graduation with the M.S. is 2.70.

5. The requirements for the BS can be found in https://catalog.gatech.edu/programs/mathematics-bs/ The requirements for the MS can be found in https://catalog.gatech.edu/programs/mathematics-ms/#requirementstext Both requirements are to be fulfilled by the end of the studies to be awarded the BS and MS.

Summary:

Students pursuing the BS/MS Option in Mathematics must complete all requirements for the Bachelor of Science in Mathematics program and the Master of Science in Mathematics program. Students may use a maximum of 6 credit hours of approved coursework (4000-level or higher; not seminar or research credit, MATH 6701 or MATH 6702) in Mathematics with grades of B or higher from the Bachelor of Science program of study.

Master of Science in Mechanical Engineering

The Woodruff School has a challenging graduate program that encompasses advanced study and research leading to the degree of Master of Science in Mechanical Engineering for qualified graduates with backgrounds in engineering, mechanics, mathematics, physical sciences, and life sciences. The graduate coursework is flexible, but the program of study must meet the Woodruff School's requirements of breadth, depth, and level. Graduate degrees in mechanical engineering can be completed through a combination of studies at Georgia Tech-Lorraine, Joint Program with Stuttgart (see Master of Science with a major in Mechanical Engineering (Undesignated)), via video course offerings, or by attending classes at the Atlanta campus.

ME: Graduate Website

The Master of Science degree in Mechanical Engineering (M.S.M.E.) has the following 30 minimum course credit-hour requirements. Only 6 credits at the 4000 level are permitted, the remaining credits must be 6000 level or above. All course work in the Coherent Major and Minor Areas must be from the College of Computing, College of Science, and/or College of Engineering. The minor will not appear on transcripts or degree documentation. Candidates for Master's degree must earn and maintain a graduate grade-point average of at least 3.0. Below are the requirements for the non-thesis and thesis option.

Non-Thesis Option

Major Area (21 hours) Must be in a coherent subject area appropriate to Mechanical Engineering or related combinations. Up to 6 credit hours of Special Problems courses of focused research under a supervision of a faculty member is allowed towards the 30 credit hour of the program.

Minor Area (6 hours) The coherent minor area must be distinctly different from the major area. Note: ME 6753, ME 6789, and ME 6799 may only be used to satisfy the minor. COA 8685, COA 8833 (with title Computational Simulation of Building Design), MGT 6165 and BC 6650 may be included in the minor. ME 6753 and BC 6650 may not be counted together in the minor. Only ME 4405 or ME 6705 can count towards the degree, but not both.

Math Area (3 hours) Only courses from the School of Mathematics fulfill the mathematics requirement.

Thesis Option

The Thesis Option involves working with a faculty member on a project in a wide range of research topics being investigated by Woodruff School faculty members. This will give hands-on experience in working with a faculty mentor; the opportunity to work in a laboratory or a research environment; and the chance to perform theoretical and experimental work. These events will foster the career interests and expand the selection of possible employers. In some cases, a student will receive a graduate research assistantship, which includes a stipend and a tuition waiver. The time to graduation depends on the thesis project, advisor, and the work ethic.

Major Area (21 hours) This area will consist of 12 hours of coursework in a coherent subject area appropriate to Mechanical Engineering or related combinations and 9 hours of MS thesis hours.

Minor Area (6 hours) The coherent minor area must be distinctly different from the major area. Note: ME 6753, ME 6789, and ME 6799 may only be used to satisfy the minor. COA 8685, COA 8833 (with title Computational Simulation of Building Design), MGT 6165 and BC 6650 may be included in the minor. ME 6753 and BC 6650 may not be counted together in the minor. Only ME 4405 or ME 6705 can count towards the degree, but not both.

Math Area (3 hours) Only courses from the School of Mathematics fulfill the mathematics requirement.

The BS/MS Program

The Woodruff School offers a BS/MS program for those students who demonstrate an interest in and ability for additional education beyond the BS degree.

- Students must apply after earning 30 credit hours and are encouraged to apply before 75 earned credit hours, including transfer and AP credit hours.
- Students must have received a grade in COE 2001, Statics, before they apply.
- Students must complete a minimum of 12-24 credit hours at Georgia Tech, including degree applicable STEM classes.
- Students have shown appropriate progress towards their degree program.
- Obtained a grade point average (GPA) of 3.5 or higher based on classes taken at Georgia Tech. Transfer classes are not included.
- For students applying after earning 75 credit hours: All parts of the application must be received before the withdrawal deadline of the first semester you take ME 3057 (ME students) or NRE 4350 (NRE students). If any parts of the application are received after this time, students must apply to the MS program through the regular process.

Participants in the BS/MS Program in the Woodruff School can obtain a master's degree in mechanical engineering, nuclear engineering, medical physics, or in Georgia Tech's interdisciplinary bioengineering graduate program. There are two options to consider: Non-thesis (30 hours of coursework) or non-thesis (21 hours of course plus 9 hours of thesis).

BS/MS Information

Master of Science in Medical Physics

The graduate program in medical physics leads to the degree of Master of Science in Medical Physics (MS MP) and a Doctor of Philosophy as an option under the PhD program in nuclear engineering. The program focuses on the application of radiation to medicine, particularly in the diagnosis and treatment of human disease. In addition to the traditional on-campus MS program, a distance learning program leading to the MS MP degree is also offered to accommodate the needs of professionals in the field. A large number of medical physics practitioners in government and industry participate in the video-based program.

Three credit hours for graduate courses taken as an undergraduate at Georgia Tech and used for credit toward an undergraduate degree in science or engineering may also be included in the MS MP program of study if the student graduated with an undergraduate grade-point average of at least 3.5. Medical physics students must earn a graduate grade-point average of at least 3.0 and satisfy all remaining requirements to be certified for the master's degree.

Non-Thesis Option

Code	Title	Credit Hours
MP 4750	Diagnostic Imaging Physics	3
MP 6011	Seminar in Medical Physics I	1
MP 6203	Radiation Therapy Treatment Planning Laboratory	1
MP 6204	Radiation Therapy Physics	4
MP 6300	Radiological Anatomy	1
MP 6406	Radiation Dosimetry & Protection	4
MP 6407	Radiation Biology and Oncology	3
MP 6756	Radiation Physics	3
MP 6757	Radiation Detection	3
MP 8903	Special Problems (Project for Non-Thesis)	3
Other Elective Courses (any other graduate level course)		9
Total Credit Hours		**35**

Thesis Option

Code	Title	Credit Hours
MP 4750	Diagnostic Imaging Physics	3
MP 6011	Seminar in Medical Physics I	1
MP 6203	Radiation Therapy Treatment Planning Laboratory	1
MP 6204	Radiation Therapy Physics	4
MP 6300	Radiological Anatomy	1
MP 6406	Radiation Dosimetry & Protection	4
MP 6407	Radiation Biology and Oncology	3
MP 6756	Radiation Physics	3
MP 6757	Radiation Detection	3
Other Elective Courses (Any other graduate level course)		3
Thesis Hours		9
Total Credit Hours		**35**

Master of Science in Music Technology

Technology has always driven cultural and social transformations in the manner in which we make, perform, distribute and listen to music. Recent technological developments in areas such as artificial intelligence, brain and cognitive science, robotics, education and networking have fundamentally changed musical practices and created a need in the industry and academia for well-educated music and audio technologists able to design, develop, and creatively employ the next generation of musical software and hardware for composition, performance, recording and distribution. The Georgia Tech School of Music's Master of Science in Music Technology program prepares students for careers in professional software, hardware and audio companies, the arts and entertainment industries, as well as in the education/academic markets. This interdisciplinary degree program enables students to extend their skills in areas such as music, computing, electrical engineering, mechanical engineering, and industrial design, all within in a research-focused program that emphasizes the intersections between technical innovation and creative practice.

The Master of Science in Music Technology is a four-semester program for a total of 48 credit hours. Applicants will be admitted to the program with an undergraduate degree in music, computing, engineering, or a related degree. Applicants will have to demonstrate their musical background in performance, composition and/or theory, as well as basic skills in computing and/or engineering in order to be admitted to the program. The School of Music's graduate admissions committee reviews applications and a portfolio of applicant creative and technical work to determine an applicant's qualifications. Upon acceptance, each student will be assigned a faculty advisor who will consult and approve student's course selections. After the first year of study and with the approval of their faculty advisor, students will choose between two academic tracks:

Project Track: Students will complete a set of requirements that will include at least 18 music technology course credit hours, 18 elective course credit hours, and 12 research credit hours leading to the development of a final MS project in Music Technology. A minimum of 30 course credit hours must be taken at the 6000-level or higher.

Thesis Track: Students will complete a set of requirements that will include at least 18music technology course credit hours, 12 elective course credit hours, 12 research hours and 6 Thesis Preparation credit hours, leading to the completion and submission of an MS Thesis in Music Technology. A minimum of 30 course credit hours must be taken at the 6000-level or higher.

Curriculum Requirements (by track)

Project Track

Code	Title	Credit Hours
Required Music Technology Core Courses		
MUSI 6001	Music Perception and Cognition	3
MUSI 6003	Music Technology History and Repertoire	3
MUSI 6202	Digital Signal Processing for Music Analysis and Synthesis	3
Required Music Technology Research Courses		
MUSI 7100	Music Technology Research Laboratory	12
Required Music Technology Creative Course		3
MUSI 6002	Computer Supported Interactive Music	
MUSI 6004	Technology Ensemble	
MUSI 6203	Project Studio in Music Technology	
Additional Music Technology Electives		6
MUSI 6005	Music Ensemble for Graduate Students	
MUSI 6103	Music Recording and Mixing	
MUSI 6104	Integrating Music into Multimedia	
MUSI 6105	Digital Media Production and Mastering	
MUSI 6106	Audio Software Engineering	
MUSI 6201	Audio Content Analysis	
MUSI 6301	Music Interface Design	
MUSI 6302	The Musical Mind	
MUSI 6303	Network Music	
MUSI 6304	Computer Music Composition	
MUSI 8001	Research Methods	
MUSI 8002	Apprentice Teaching	
Additional Elective Courses (subject to advisor approval) [1]		18
Total Credit Hours		**48**

[1] Elective courses may include additional Music courses and/or courses in other academic units that are approved by the student's advisor.

Thesis Track

Code	Title	Credit Hours
Required Music Technology Core Courses		
MUSI 6001	Music Perception and Cognition	3
MUSI 6003	Music Technology History and Repertoire	3
MUSI 6202	Digital Signal Processing for Music Analysis and Synthesis	3
Required Music Technology Research Courses		
MUSI 7100	Music Technology Research Laboratory	12
Required Music Technology Creative Course		3
MUSI 6002	Computer Supported Interactive Music	
MUSI 6004	Technology Ensemble	
MUSI 6203	Project Studio in Music Technology	
Additional Music Technology Electives		6
MUSI 6005	Music Ensemble for Graduate Students	
MUSI 6103	Music Recording and Mixing	
MUSI 6104	Integrating Music into Multimedia	
MUSI 6105	Digital Media Production and Mastering	
MUSI 6106	Audio Software Engineering	
MUSI 6201	Audio Content Analysis	
MUSI 6301	Music Interface Design	
MUSI 6302	The Musical Mind	
MUSI 6303	Network Music	
MUSI 6304	Computer Music Composition	
MUSI 8001	Research Methods	
MUSI 8002	Apprentice Teaching	
Additional Elective Courses (subject to advisor approval) [1]		12
Thesis Credit Hours		
MUSI 7000	Master's Thesis	6
Total Credit Hours		**48**

[1] Elective courses may include additional Music courses and/or courses in other academic units that are approved by the student's advisor.

For more information see - http://gtcmt.gatech.edu/?p=2530

BS/MS Option in Music Technology

Students will be eligible to apply for the program after completion of 30 semester credit hours at Georgia Tech and appropriate progress in their degree program. As a practical matter, students should apply for the program at least three semesters prior to graduation in order to take graduate-level courses prior to receiving their BS degree. Students must have a Georgia Tech GPA of 3.5 or higher for admission into the BS/MS Program in Music Technology. This program is available only to those completing a Bachelor's degree in music technology. Admissions decisions will be based on GPA and a portfolio review by the School of Music's Graduate Program Committee.

Students in the joint BS/MS program remain undergraduates until they meet the requirements for the bachelor's degree, at which point they will receive the BSMT degree. Their status will then be changed to graduate status. Graduate school application fees and the GRE requirements are waived. Once admitted, a GPA of at least 3.0 must be maintained to remain in the program. Additionally, students in the BS/MS program are eligible to use the Graduate Course Option even if their cumulative grade-point average is below 3.5 at the time they complete their bachelor's degree. The program will not penalize students who opt out after the bachelor's degree.

Note the following:

- BS/MS students may combine any concentration in the Bachelor of Science in Music Technology with either the project or thesis track in the Master of Science in Music Technology.
- BS/MS students will be expected to complete Intro to Audio Technology II before enrolling in any graduate-level coursework. This course is typically taken by students in their fourth semester of undergraduate study.
- Six credit hours may be counted towards both the undergraduate and graduate degrees as follows:
  - MUSI 6001 (Music Perception & Cognition), a requirement for the MS degree, can also fulfill the requirement of MUSI 4677 (Music Perception & Cognition) for the BS degree.
  - MUSI 6103 (Music Recording & Mixing), an elective for the MS degree, can also fulfill the requirement of MUSI 4630 (Music Recording & Mixing) for the BS degree.
  - Any other MUSI 6XXX course that fulfills a core or elective requirement for the MSMT can also be used to fulfill the MUSI Upper Division Elective Requirement for the BSMT.

Master of Science in Nuclear Engineering

The graduate program in nuclear and radiological engineering/medical physics leads to the degrees of

- Master of Science in Nuclear Engineering,
- Master of Science in Medical Physics,
- Master of Science, and
- Doctor of Philosophy.

In nuclear and radiological engineering, students with a bachelor's degree in engineering pursue the Master of Science in Nuclear Engineering degree, while students with a Bachelor of Science degree in other fields enroll for the Master of Science degree. Depending on the career objectives of the student, the Woodruff School may encourage a thesis as part of the Master of Science program. Nuclear and radiological engineering students must earn a graduate grade-point average of at least 3.0 and satisfy all remaining requirements to be certified for the master's degree.

Non-Thesis requirements

Code	Title	Credit Hours
NRE 6101	Transport Fundamentals	3
NRE 6756	Radiation Physics	3
NRE 6401	Advanced Nuclear Engineering Design	3
Select one:		3
NRE 6102	Plasma Physics	
NRE 6201	Reactor Physics	

NRE 6301	Reactor Engineering	
NRE 6757	Radiation Detection	
NRE Elective		3
Math Elective		3
Electives		12
Total Credit Hours		**30**

Thesis requirements

Code	Title	Credit Hours
NRE 6101	Transport Fundamentals	3
NRE 6756	Radiation Physics	3
Select one:		3
NRE 6102	Plasma Physics	
NRE 6201	Reactor Physics	
NRE 6301	Reactor Engineering	
NRE 6757	Radiation Detection	
NRE Elective		3
Math Elective		3
Electives		6
NRE 7000	Master's Thesis	9
Total Credit Hours		**30**

Nuclear Enterprise Management option (Non-thesis)

Code	Title	Credit Hours
NRE 6101	Transport Fundamentals	3
NRE 6401	Advanced Nuclear Engineering Design	3
NRE 6756	Radiation Physics	3
Select one:		3
NRE 6102	Plasma Physics	
NRE 6201	Reactor Physics	
NRE 6301	Reactor Engineering	
NRE 6757	Radiation Detection	
Math Elective:		3
NRE 6103	Computational Methods of Radiation Transport	
NRE/ME 6758	Numerical Methods in Mechanical Engineering	
NRE 6504	Management of the Nuclear Enterprise	3
ME/MGT 6753	Principles of Management for Engineers	3
NEM Elective:		3
Any ISYE, MGT 6000-level or higher course		
Electives		6
Total Credit Hours		**30**

Nuclear Enterprise Management option (Thesis)

Code	Title	Credit Hours
NRE 6101	Transport Fundamentals	3
NRE 6756	Radiation Physics	3
Select one:		3
NRE 6102	Plasma Physics	
NRE 6201	Reactor Physics	
NRE 6301	Reactor Engineering	
NRE 6757	Radiation Detection	
Math Elective:		3
NRE 6103	Computational Methods of Radiation Transport	
NRE/ME 6758	Numerical Methods in Mechanical Engineering	
NRE 6504	Management of the Nuclear Enterprise	3
ME/MGT 6753	Principles of Management for Engineers	3
NEM Elective:		3
Any ISYE, MGT 6000-level or higher class		
NRE 7000	Master's Thesis	9
Total Credit Hours		**30**

Master of Science in Operations Research

The School of Industrial and Systems Engineering (ISYE) offers eight master's degrees:

- Master of Science in Industrial Engineering (MS IE);
- Master of Science in Operations Research (MS OR);
- Master of Science in Supply Chain Engineering (MS SCE);
- Master of Science in Statistics (MS STAT);
- Master of Science in Health Systems (MS HS);
- Master of Science in Quantitative and Computational Finance (MS QCF);
- Master of Science in International Logistics (MS IL) that is part of the executive program; and
- Master of Science in Computational Science and Engineering (MS CSE).

Three of these programs are interdisciplinary:

- MS QCF (joint with School of Mathematics, College of Business),
- MS STAT (joint with School of Mathematics) and
- MS SCE (joint with College of Computing, School of Mathematics).

All proposed master's degree programs require thirty semester credit hours with the exception of MS IL and MS QCF (thirty-six credit hours) and MS HS (thirty-three credit hours). None of these MS programs contains a thesis option.

A student seeking a master's degree must have a bachelor's degree and typically one earned in engineering, science, mathematics, or some other field that provides an adequate background for the successful completion of one of ISyE's programs. Students having backgrounds from unaccredited degree programs or in programs that are found lacking in relative substance can expect to first take preliminary coursework in order to elevate their preparation to the level required. The prerequisite coursework for the various master's degrees includes strong performance in probability, statistics, linear algebra, and calculus.

Every MS curriculum is based on core classes offered from the School of ISyE, as well as electives offered by ISyE and other Georgia Tech schools in engineering and science. The MS SCE, MS QCF, and MS IL are professional degree programs with separate curriculums from the other regular MS degrees.

MS Human-Integrated Systems

Program Requirements

Code	Title	Credit Hours
Core		
ISYE 6644	Simulation	3
ISYE 6650	Probabilistic Models and Their Applications	3
ISYE 6669	Deterministic Optimization	3
Statistics and Data Science Elective		**3**
MATH 4261	Mathematical Statistics I	
ISYE 6412	Theoretical Statistics	
ISYE 6414	Statistical Modeling and Regression Analysis	
or ISYE 7	Advanced Statistical Modeling	
or MATH	Linear Statistical Models	
ISYE 6740	Computational Data Analysis: Learning, Mining, and Computation	
ISYE 6413	Design and Analysis of Experiments	
or ISYE 7	Advanced Design of Experiments	
ISYE 6416	Computational Statistics	
ISYE 6420	Introduction to Theory and Practice of Bayesian Statistics	
MATH 6262	Advanced Statistical Inference I	
MATH 6263	Testing Statistical Hypotheses	
Algorithms and Computation Elective		**3**
ISYE 6679	Computational Methods in Optimization	
ISYE 6740	Computational Data Analysis: Learning, Mining, and Computation	
ISYE 8813	Special Topics in Operations Research (Constraint Programming)	
CS 6505	Computability, Algorithms, and Complexity	
CS 6520	Computational Complexity Theory	
CS 6550	Design and Analysis of Algorithms	
CSE 6140	Computational Science and Engineering Algorithms	
Technical Electives (Choose 3)		**9**
ISYE 6230	Economic Decision Analysis	
ISYE 6307	Scheduling Theory	
ISYE 6320	Public Impact Applications of Operations Research and Management Science	
ISYE 6645	Monte Carlo Methods	
ISYE 6661	Linear Optimization	
ISYE 6662	Discrete Optimization	
ISYE 6663	Nonlinear Optimization	
ISYE 6664	Stochastic Optimization	
ISYE 6679	Computational Methods in Optimization	
ISYE 6761	Stochastic Processes I	
ISYE 6762	Stochastic Processes II	
ISYE 6832	Simulation Theory and Methods	
ISYE 7201	Production and Service Systems Engineering	
ISYE 7203	Logistics Systems Engineering	
ISYE 8813	Special Topics in Operations Research (Inventory Theory)	
ISYE 8813	Special Topics in Operations Research (Constraint Programming)	
ISYE 8813	Special Topics in Operations Research (Stochastic Programing)	
ISYE 8813	Special Topics in Operations Research (Game Theory)	
ISYE 8813	Special Topics in Operations Research (Infrastructure Optimization)	
Breadth Electives (Choose 2)		**6**
ISYE 6225	Advanced Engineering Economy	
ISYE 6201	Manufacturing Systems	
or ISYE 7201	Production and Service Systems Engineering	
ISYE 6202	Warehousing Systems	
ISYE 6203	Transportation and Supply Chain Systems	
or ISYE 7203	Logistics Systems Engineering	
ISYE 8813	Special Topics in Operations Research (Inventory Theory)	
ISYE 6405	Statistical Methods for Manufacturing Design and Improvement	
ISYE 6402	Time Series Analysis	
ISYE 6404	Nonparametric Data Analysis	
ISYE 6413	Design and Analysis of Experiments	
or ISYE 7	Advanced Design of Experiments	
ISYE 6414	Statistical Modeling and Regression Analysis	
or ISYE 7401	Advanced Statistical Modeling	
or MATH 6266	Linear Statistical Models	
ISYE 6416	Computational Statistics	
ISYE 6420	Introduction to Theory and Practice of Bayesian Statistics	
ISYE 7406	Data Mining and Statistical Learning	
ISYE 8813	Special Topics in Operations Research (Mathematics of Operations Research)	
ISYE 6740	Computational Data Analysis: Learning, Mining, and Computation	
CSE 6242	Data and Visual Analytics	
CSE 6730	Modeling and Simulation: Foundations and Implementation	
MATH 4317	Analysis I	
MATH 6337	Real Analysis I	
MATH 6338	Real Analysis II	
MATH 6014	Graph Theory and Combinatorial Structures	
MATH 6241	Probability I	
MATH 6242	Probability II	
MATH 6643	Numerical Linear Algebra	
MATH 6262	Advanced Statistical Inference I	
MATH 6263	Testing Statistical Hypotheses	
CS 6236	Parallel and Distributed Simulation Systems	
CS 6505	Computability, Algorithms, and Complexity	
CS 6520	Computational Complexity Theory	
CS 6550	Design and Analysis of Algorithms	
Total Credit Hours		**30**

Up to six (6) credits of 4000-level courses may be used towards the degree, subject to the approval of the ISyE Director of Master's Programs

Practicum Track Requirements

Code	Title	Credit Hours
Core		
ISYE 6650	Probabilistic Models and Their Applications	3
ISYE 6669	Deterministic Optimization	3
Statistics and Data Science Elective		**3**
MATH 4261	Mathematical Statistics I	
ISYE 6412	Theoretical Statistics	
ISYE 6414	Statistical Modeling and Regression Analysis	
or ISYE 7401	Advanced Statistical Modeling	
or MATH 6266	Linear Statistical Models	
ISYE 6740	Computational Data Analysis: Learning, Mining, and Computation	
ISYE 6413	Design and Analysis of Experiments	
or ISYE 7400	Advanced Design of Experiments	
ISYE 6416	Computational Statistics	
ISYE 6420	Introduction to Theory and Practice of Bayesian Statistics	
MATH 6262	Advanced Statistical Inference I	
MATH 6263	Testing Statistical Hypotheses	
Algorithms and Computation Elective		**3**
ISYE 6679	Computational Methods in Optimization	
ISYE 6740	Computational Data Analysis: Learning, Mining, and Computation	
ISYE 8813	Special Topics in Operations Research (Constraint Programming)	
CS 6505	Computability, Algorithms, and Complexity	
CS 6520	Computational Complexity Theory	
CS 6550	Design and Analysis of Algorithms	
CSE 6140	Computational Science and Engineering Algorithms	
Technical Electives (Choose 3)		**9**
ISYE 6230	Economic Decision Analysis	
ISYE 6307	Scheduling Theory	
ISYE 6320	Public Impact Applications of Operations Research and Management Science	
ISYE 6645	Monte Carlo Methods	
ISYE 6661	Linear Optimization	
ISYE 6662	Discrete Optimization	
ISYE 6663	Nonlinear Optimization	
ISYE 6664	Stochastic Optimization	
ISYE 6679	Computational Methods in Optimization	
ISYE 6761	Stochastic Processes I	
ISYE 6762	Stochastic Processes II	
ISYE 6832	Simulation Theory and Methods	
ISYE 7201	Production and Service Systems Engineering	
ISYE 7203	Logistics Systems Engineering	
ISYE 8813	Special Topics in Operations Research (Inventory Theory)	
ISYE 8813	Special Topics in Operations Research (Constraint Programming)	
ISYE 8813	Special Topics in Operations Research (Stochastic Programing)	
ISYE 8813	Special Topics in Operations Research (Game Theory)	
ISYE 8813	Special Topics in Operations Research (Infrastructure Optimization)	
Breadth Electives (Choose 2)		**6**
ISYE 6225	Advanced Engineering Economy	
ISYE 6201	Manufacturing Systems	
or ISYE 7201	Production and Service Systems Engineering	
ISYE 6202	Warehousing Systems	
ISYE 6203	Transportation and Supply Chain Systems	
or ISYE 7203	Logistics Systems Engineering	
ISYE 8813	Special Topics in Operations Research (Inventory Theory)	
ISYE 6405	Statistical Methods for Manufacturing Design and Improvement	
ISYE 6402	Time Series Analysis	
ISYE 6404	Nonparametric Data Analysis	
ISYE 6413	Design and Analysis of Experiments	
or ISYE 7400	Advanced Design of Experiments	
ISYE 6414	Statistical Modeling and Regression Analysis	
or ISYE 7401	Advanced Statistical Modeling	
or MATH 6266	Linear Statistical Models	
ISYE 6416	Computational Statistics	
ISYE 6420	Introduction to Theory and Practice of Bayesian Statistics	
ISYE 7406	Data Mining and Statistical Learning	
ISYE 8813	Special Topics in Operations Research (Mathematics of Operations Research)	
ISYE 6740	Computational Data Analysis: Learning, Mining, and Computation	
CSE 6242	Data and Visual Analytics	
CSE 6730	Modeling and Simulation: Foundations and Implementation	
MATH 4317	Analysis I	
MATH 6337	Real Analysis I	
MATH 6338	Real Analysis II	
MATH 6014	Graph Theory and Combinatorial Structures	
MATH 6241	Probability I	
MATH 6242	Probability II	
MATH 6643	Numerical Linear Algebra	
MATH 6262	Advanced Statistical Inference I	
MATH 6263	Testing Statistical Hypotheses	
CS 6236	Parallel and Distributed Simulation Systems	
CS 6505	Computability, Algorithms, and Complexity	
CS 6520	Computational Complexity Theory	
CS 6550	Design and Analysis of Algorithms	
Internship Preparation Elective [1]		**3**
ISYE 6230	Economic Decision Analysis	
ISYE 6644	Simulation	
ISYE 6701	Energy Technology and Policy	
Practicum		
COOP/INTN/ISYE Practicum		
Total Credit Hours		**30**

Up to six (6) credits of 4000-level courses may be used towards the degree, subject to the approval of the ISyE Director of Master's Programs

[1] ISYE Special Topics courses, as appropriate

BS/MS OPTION

The BSMS Option allows eligible students to double count a maximum of 6 credit hours toward undergraduate and graduate requirements while still completing all other program requirements to earn both degrees.

BS in Industrial Engineering students with a GPA of 3.5 or higher who have taken ISYE 3133 and ISYE 3232 are eligible to apply to utilize the BSMS Option. BSIE students must also graduate with a GPA of 3.5 or higher in order to utilize the BSMS Option.

It is typical for students to use 6 hours from the BSIE concentration electives to count as Core Courses or Technical Electives for the MS in Operations Research degree. Students will need to consult with an advisor to indicate which courses are sharing with the graduate degree in DegreeWorks.

Master of Science in Physics

Physics: Graduate Information

Code	Title	Credit Hours
Required Courses		
PHYS 6103	Electromagnetism I	3
PHYS 6105	Quantum Mechanics I	3
PHYS 6106	Quantum Mechanics II	3
PHYS 6107	Statistical Mechanics I	3
8000- level Special Problems or Master's Practicum research [1]		6
Elective Courses		
Select twelve credit hours from either of the following:		12
Physics lecture courses at the 6000-level or higher [2]		
Graduate courses at the 6000-level or higher from a school other than Physics [3]		
Total Credit Hours		**30**

[1] With a Physics faculty member

[2] 4000-level courses are allowed with approval from the Physics Graduate Coordinator

[3] with approval from the Physics Graduate Coordinator

BS/MS OPTION

The BSMS Option allows eligible students to double count a maximum of 6 credit hours toward undergraduate and graduate requirements while still completing all other program requirements to earn both degrees.

To apply for the option, undergraduate Physics students (BS in Applied Physics or BS in Physics) must have at least 30 credit hours earned at Georgia Tech with an undergraduate GPA of 3.3 or higher, and fewer than 90 credits overall (including transfer credit).

The minimum GPA to graduate with an undergraduate degree in Applied Physics/Physics to continue to the MS in Physics program is 3.0. The minimum GPA for graduation with the MS in 2.7.

Students will need to consult with an advisor to indicate which courses are sharing with the graduate degree in DegreeWorks.

Master of Science in Psychology

The School of Psychology does not accept students seeking a terminal master's degree in Psychology. The Master of Science in Psychology prepares the student for the continuation of graduate work toward the Ph.D. and/or for employment in business, industry, government, or education.

PSYC: Graduate Information

Thesis Option

Code	Title	Credit Hours
Course Requirements		
PSYC 6000	Responsible Conduct of Research (RCR)	1
PSYC 6018	Principles of Research Design	3
PSYC 6019	Statistical Analysis of Psychological Data I	5
PSYC 6020	Statistical Analysis of Psychological Data II	5
PSYC 6040	Current Topics in Cognition and Brain Sciences	1
or PSYC 604	Current Topics in Cognitive Aging	
or PSYC 604	Engineering Psychology Research Seminar	
PSYC electives [1,2]		9
Master Thesis Requirement		
PSYC 7000	Master's Thesis	6
Total Credit Hours		**30**

All courses must be completed with a grade of 'B' or higher

[1] PSYC 7101 and PSYC 7102 are required elective courses for Engineering Psychology students

[2] Up to a total of 6 hours of 4000 level credit, at a grade of B or above, can be used toward this degree from the following list of courses: NEUR 4100, NEUR 4238, NEUR 4300, NEUR 4400, NEUR 4740, PSYC 4010, PSYC 4011, PSYC 4020, PSYC 4025, PSYC 4041, PSYC 4050, PSYC 4090, PSYC 4100, PSYC 4260, PSYC 4270, PSYC 4740, PSYC 4770. PSYC/NEUR 4XXX special topics courses will be considered on a case by case basis. PSYC/NEUR 4XXX and PSYC/NEUR 6XXX course which are largely equivalent can't both be counted.

Non-Thesis Option

Code	Title	Credit Hours
Course Requirements		
PSYC 6000	Responsible Conduct of Research (RCR)	1
PSYC 6018	Principles of Research Design	3
PSYC 6019	Statistical Analysis of Psychological Data I	5
PSYC 6020	Statistical Analysis of Psychological Data II	5
PSYC 6040	Current Topics in Cognition and Brain Sciences	1
or PSYC 604	Current Topics in Cognitive Aging	
or PSYC 604	Engineering Psychology Research Seminar	
PSYC 6XXX-level or higher electives [1,2]		15
Total Credit Hours		**30**

All courses must be completed with a grade of 'B' or higher

[1] PSYC 7101 and PSYC 7102 are required elective courses for Engineering Psychology students

[2] Up to a total of 6 hours of 4000 level credit, at a grade of B or above, can be used toward this degree from the following list of courses: NEUR 4100, NEUR 4238, NEUR 4300, NEUR 4400, NEUR 4740, PSYC 4010, PSYC 4011, PSYC 4020, PSYC 4025, PSYC 4041, PSYC 4050, PSYC 4090, PSYC 4100, PSYC 4260, PSYC 4270, PSYC 4740, PSYC 4770. PSYC/NEUR 4XXX special topics courses will be considered on a case by case basis. PSYC/NEUR 4XXX and PSYC/NEUR 6XXX course which are largely equivalent can't both be counted.

Master of Science in Public Policy

The Master of Science in Public Policy is designed for students with strong analytical backgrounds, such as those received in engineering, natural science, or an analytically oriented social science or humanities curriculum. Graduate studies in public policy focus on areas in which either the consequences of scientific and technological activity have significant public policy implications, or technical and scientific information is a significant input to the policy-making process. Current areas of specialization for the School include science and technology policy, environmental and energy policy, information and telecommunication policy, and regional economic development policy.

PUBP MS Information

The MS in Public Policy requires forty-six credit hours of study, including either:

1. three credit hours devoted to producing a professional policy research paper or team research project or
2. nine credit hours for a thesis.

In general, it is expected that students planning to enter employment upon completing the degree will choose the paper or project option, while students planning to continue their graduate work will choose the thesis option.

The program requires a twenty-five-credit-hour core curriculum consisting of five substantive elements:

1. policy and organizational analysis;
2. ethics, philosophy, and public policy;
3. economics and public finance;
4. methods of analysis, including quantitative analysis and research design; and
5. a capstone course in public policy analysis.

In addition, there is a required one-credit hour introductory graduate seminar in public policy. Based on prior coursework or a test-out exam, students may request up to 6 credit hours of exemptions from core courses. In individual cases, students may be required to take pre-core preparatory courses to be ready for graduate studies in particular methodological or analytical areas.

Code	Title	Credit Hours
Core Courses		
PUBP 6001	Introduction to Public Policy	1
PUBP 6010	Ethics, Epistemology, and Public Policy	3
PUBP 6012	Fundamentals of Policy Processes	3
PUBP 6112	Research Design in Policy Science	3
PUBP 6114	Applied Policy Methods and Data Analysis	3
PUBP 6116	Microeconomics for Policy Analysis	3
PUBP 6118	Public Finance Policy	3
PUBP 6201	Public Policy Analysis	3
Select one of the following:		3
PUBP 6014	Organization Theory	
PUBP 6017	Public Management	
PUBP 6018	Policy Implementation and Administration	
Total Credit Hours		**25**

Students must achieve a grade of B or higher in all core courses. In addition to elective courses in the School of Public Policy, students may develop their own programs of study by taking courses in other Georgia Tech schools, including those in the Ivan Allen College and the Colleges of Architecture, Management, Sciences, and Engineering. A summer internship, work experience, or co-op assignment between the first and second years offers students insight into a research or professional setting related to their career interests.

For the MSPP, students are encouraged to pursue one or more concentrations. A concentration consists of at least three 3-credit hour courses, of which at least one is the School of Public Policy. Students can pursue concentrations within groups already developed by the faculty (see above). Or, students can pursue an individualized concentration, with the written approval of the proposed concentration program of study by their advisor.

BS/MS Public Policy

The School of Public Policy offers a BS/MS program for students enrolled in the undergraduate program who demonstrate an interest in and ability for additional education beyond the BS degree.

Students in the BS/MS program will remain undergraduates until they meet requirements for the undergraduate degree, at which point they will receive their BS degree and be changed to graduate status. Students will be eligible to apply for the program after completion of 30 semester credit hours at Georgia Tech (i.e., at the end of their first year), and if they show appropriate progress in their degree program thereafter. Any student in good standing in the BS PP program is eligible to apply to the program. Admissions decisions will be based on GPA and judgments of the faculty who have served as advisors or instructors. Continuation in the program will require the student to maintain a GPA of 3.0 or higher in public policy courses. The program will not penalize students who opt out after the bachelor's degree. Students participating in this program will be eligible for the six semester credit-hour Graduate Course Option, which allows students completing both the bachelor's and master's in the same discipline to use up to 6 credit hours of graduate-level coursework in the major discipline for both degrees.

The graduate-level credits required in the BS/MS Program are usually as follows:

Code	Title	Credit Hours
Core		22
Electives		12

Capstone/Research Paper	3
Total Credit Hours	**37**

Requirements

Code	Title	Credit Hours
Core Courses		
PUBP 6001	Introduction to Public Policy	1
PUBP 6010	Ethics, Epistemology, and Public Policy	3
PUBP 6112	Research Design in Policy Science [1]	3
PUBP 6114	Applied Policy Methods and Data Analysis	3
PUBP 6116	Microeconomics for Policy Analysis	3
PUBP 6118	Public Finance Policy	3
PUBP 6201	Public Policy Analysis	3
Select one of the following:		3
PUBP 6014	Organization Theory	
PUBP 6017	Public Management	
PUBP 6018	Policy Implementation and Administration	
Electives		
Electives		12
Concentration		
Concentration [2]		6
Capstone/Research Paper		
PUBP 6801	Research Paper	3
Total Credit Hours		**43**

1. This course should be taken as an undergraduate instead of PUBP 3130 and will count for both programs
2. Students are required to develop, in consultation with their advisor, a six credit hour concentration in an area or specialty relevant to public policy and management (e.g. environmental policy, science and technology policy, urban policy, economic development, information and communications policy, policy evaluation, public management).

Contact the BS PP program director for further information.

BS/MS Information

Master of City and Regional Planning and Master of Science in Public Policy

The degree programs in Public Policy and City and Regional Planning prepares students for policy analysis and planning work at the national, state, and local levels. Graduates work in public, private, and non-profit settings building on the complementary perspectives and skills of the two professions.

In addition to providing interdisciplinary professional training, the dual degree also provides the opportunity to step toward Ph.D. programs in either Public Policy or Planning with an emphasis on Urban, Environmental, or Economic Development Policy.

All students must complete a minimum combined requirement of 75 credit hours for the dual degree program. Students receive both degrees.

Click here for more information about the MCRP/MSPUBP Option

Master of Science in Quantitative and Computational Finance

The School of Industrial and Systems Engineering (ISYE) offers eight master's degrees:

- Master of Science in Industrial Engineering (MS IE);
- Master of Science in Operations Research (MS OR);
- Master of Science in Supply Chain Engineering (MS SCE);
- Master of Science in Statistics (MS STAT);
- Master of Science in Health Systems (MS HS);
- Master of Science in Quantitative and Computational Finance (MS QCF);
- Master of Science in International Logistics (MS IL) that is part of the executive program; and
- Master of Science in Computational Science and Engineering (MS CSE).

Three of these programs are interdisciplinary:

- MS QCF (joint with School of Mathematics, College of Business),
- MS STAT (joint with School of Mathematics) and
- MS SCE (joint with College of Computing, School of Mathematics).

All proposed master's degree programs require thirty semester credit hours with the exception of MS IL and MS QCF (thirty-six credit hours) and MS HS (thirty-three credit hours). None of these MS programs contains a thesis option.

A student seeking a master's degree must have a bachelor's degree and typically one earned in engineering, science, mathematics, or some other field that provides an adequate background for the successful completion of one of ISyE's programs. Students having backgrounds from unaccredited degree programs or in programs that are found lacking in relative substance can expect to first take preliminary coursework in order to elevate their preparation to the level required. The prerequisite coursework for the various master's degrees includes strong performance in probability, statistics, linear algebra, and calculus.

Every MS curriculum is based on core classes offered from the School of ISyE, as well as electives offered by ISyE and other Georgia Tech schools in engineering and science. The MS SCE, MS QCF, and MS IL are professional degree programs with separate curriculums from the other regular MS degrees.

MS Human-Integrated Systems

Program of Study

Code	Title	Credit Hours
Core Courses		
MGT 6078	Basic Finance and Investments	3
MGT 6081	Derivative Securities	3
MATH 6635	Numerical Methods in Finance	3
ISYE/MATH 6759	Stochastic Processes in Finance	3
ISYE/MATH 6767	Design and Implementation of Systems to Support	3

ISYE/MGT 6769	Fixed Income Securities	3
Targeted Electives		**6**
ISYE 6673	Financial Optimization Models	
MGT 6090	Management of Financial Institutions	
ISYE/ MATH 6783	Statistical Techniques of Financial Data Analysis	
Capstone		
ISYE 6785	The Practice of Quantitative and Computational Finance	3
or MATH 6785	The Practice of Quantitative and Computational Finance	
or MGT 6785	The Practice of Quantitative and Computational Finance	
Free electives [1]		**9**
Total Credit Hours		**36**

[1] Select 2 courses at 6000-level or higher from Business, ISYE, CS, CSE, ECON, MATH or others which are appropriate

Program of Study (Internship/Practicum Track)

Code	Title	Credit Hours
Core Courses		
MGT 6078	Basic Finance and Investments	3
MGT 6081	Derivative Securities	3
MATH 6635	Numerical Methods in Finance	3
ISYE/MATH 6759	Stochastic Processes in Finance	3
ISYE/MATH 6767	Design and Implementation of Systems to Support	3
ISYE/MGT 6769	Fixed Income Securities	3
Targeted Electives		**6**
ISYE 6673	Financial Optimization Models	
MGT 6090	Management of Financial Institutions	
ISYE/ MATH 6783	Statistical Techniques of Financial Data Analysis	
Capstone		
ISYE 6785	The Practice of Quantitative and Computational Finance	3
or MATH 6785	The Practice of Quantitative and Computational Finance	
or MGT 6785	The Practice of Quantitative and Computational Finance	
Design Elective [1]		**3**
COOP/Internship (Audit credit) [2]		
Free electives [3]		**6**
Total Credit Hours		**36**

[1] Choose one course with QCF Faculty Director approval

[2] To be taken after the students' first semester on campus (spring enrollees only) and after one of the above design courses; some mentorship provided by faculty advisor.

[3] Select 2 courses at 6000-level or higher from Business, ISYE, CS, CSE, ECON, MATH or others which are appropriate

Shared Credit Agreement with Master of Science in Quantitative and Computational Finance and Master of Science in Computational Science and Engineering

The Master of Science in Quantitative and Computational Finance (MSQCF) and Master of Computational Science and Engineering (MSCSE)* Shared Credit Agreement allows for students admitted through the agreement to double-count 12 credits between both degree programs, for a total of 54 credits to earn both degrees. Students will need to consult with an advisor to indicate in DegreeWorks which courses/credits are shared between the two degrees.

After completion of one semester of the program to which they have been admitted, students with a 3.5 GPA or above are eligible to apply through an internal application process to be evaluated for admission to the other program. (Special consideration may also be given to students admitted to both programs for their first term.) There is no penalty for not completing either degree should a student wish to drop the added major at a later point.

*Note: Industrial and Systems Engineering (ISYE) and Computational and Science Engineering (CSE) are the only home units of the MSCSE degree that are participating in the Shared Credit Agreement. The other home units are not participating at this time.

Master of Real Estate Development

Real estate development is a multidisciplinary activity that synthesizes the physical and design components of the development of land and buildings with financial, marketing, planning and policy aspects. The Master of Real Estate Development at Georgia Tech is a collaborative academic program offering a technical, design-based degree that also explores the business, planning, and policy components of responsible real estate development to provide students the knowledge demanded for the sustainable utilization of the land. The program leverages courses and faculty from three Schools in the College of Design, the School of Architecture, the School of Building Construction and the School of City and Regional Planning.

The Master of Real Estate Development (MRED) is offered to professionals to further existing real estate careers, professionals looking to change career direction, and full-time students with undergraduate degrees in real estate, construction, architecture, landscape architecture, planning, or engineering.

The MRED is a 30-credit hour program made available to full-time students and working professionals, with the opportunity for full-time students to complete the degree in 12 to 18 months. Instruction includes regular classroom courses, studio-based real estate development courses, field studies in real estate development, and case studies involving real estate development projects.

The School of Building Construction reviews applications on a rolling basis between early and late deadlines; however, it is encouraged that full applications be completed by the early deadline, especially if the applicant is interested in being considered for limited GTA/GRA funding opportunities.

- Fall Admission: Early Deadline on January 15, Late Deadline for International applicants on April 1st, Late Deadline for U.S. Applicants on May 1st

- Spring Admission: Early Deadline on July 15, Late Deadline for International applicants on September 1st, Late Deadline for U.S. Applicants on October 1st.

For more information, visit: https://bc.gatech.edu/master-real-estate-development

This degree encompasses the full spectrum of disciplines involved in real estate development.

Code	Title	Credit Hours
Master's of Real Estate Development requirements		
Core Courses:		
BC 6175	Real Estate Development and Construction	3
BC 6575	Real Estate Production Finance	3
BC 6350	Design and Construction Law [1]	3
CP 6640	Applied Real Estate Development Methods	3
ARCH 6151	Theories of Urban Design [2]	3
Approved Electives (select four courses):		**12**
BC 6375	Trends & Pol For Res Dev	
BC 6675	Residential Design and Construction	
ARCH 6226	Green Construction	
CP 6016	Growth Management Law and Implementation	
CP 6105	Land Conservation	
CP 6112	Introduction to Land Use Planning	
CP 6611	Principles of Real Estate Finance and Development	
CP 6233	Sustainable Urban Development	
MGT 6082	Fundamentals of Real Estate Development	
Capstone		
BC 6875	Real Estate Development Capstone Project	3
Total Credit Hours		**30**

[1] BC 6475 may serve as substitute
[2] BC 6270 may serve as substitute

Admission to the MRED program requires the following:

- A bachelor's degree from an accredited institution with a minimum 3.0 GPA
  - No work experience is required for applicants with one of the following degrees: Construction Management, Architecture, Architecture Engineering, Civil Engineering, Landscape Architecture, City Planning, or Real Estate
  - All other applicants must have a minimum of two years' experience in the real estate development industry (including Accounting, Finance, Business, and Property Management)
- Proof of English Proficiency (i.e., TOEFL)
- GRE or GMAT test scores within the past five years
- Two letters of recommendation

Application deadline, including all supporting documents, is **June 1** for the fall cohort.

For more information, visit: https://bc.gatech.edu/master-real-estate-development

Master of Science in Robotics

The MS in Robotics will be an interdisciplinary program offered collaboratively by six schools in the Colleges of Computing, Engineering and Sciences:

- Aerospace Engineering
- Biomedical Engineering
- Electrical and Computer Engineering
- Interactive Computing
- Mechanical Engineering
- Physics

Students may apply to enter the program through any one of the participating units, the choice of which usually reflects that student's intended area of specialization and general background. Students with diverse and eclectic backgrounds are encouraged to apply, including those with previous work experience.

Program of Study

General Guidelines:

- All courses must be completed letter-grade
- Minimum GPA 3.0 required
- A maximum of six (6) credit hours of 4000-level courses may be applied to the program requirements

Code	Title	Credit Hours
AE/BMED/CS/ECE/ME 7785	Introduction to Robotics Resesarch	3
AE/BMED/CS/ECE/ME/PHYS 7741	Robotics Professional Preparation	1
AE/BMED/CS/ECE/ME/PHYS 7742	Robotics Professional Preparation 2	1
AE/BMED/CS/ECE/ME/PHYS 7743	Robotics Professional Preparation 3	1
Foundation Courses		**9**
AE 6210	Advanced Dynamics I	
AE 6530	Multivariable Linear Systems and Control	
AE 6721	Evaluation of Human Integrated Systems	
BMED 8813	Special Topics (Robotics)	
CS 6601	Artificial Intelligence	
CS 6476	Introduction to Computer Vision GR	
CS 7633	Human-Robot Interaction	
CS 7492	Simulation of Biological Systems	
ECE 6550	Linear Systems and Controls	
ME 6401	Linear Control Systems	
ME 6406	Machine Vision	
ME 6407	Robotics	
ME 6441	Dynamics of Mechanical Systems	
PHYS 6101	Classical Mechanics I	
Robotics Elective Courses		**9**
Open Electives		**6**

Robotics Internship		
AE/BMED/ CS/ECE/ME/ PHYS 8741	Robotics Capstone Project	6
Total Credit Hours		**36**

Master of Science in Statistics

The School of Mathematics offers the degree of Master of Science in Statistics (MS STAT) in cooperation with the School of Industrial and Systems Engineering. It is available for applicants having the BS in mathematics; students with engineering backgrounds should enter the same program through the School of Industrial and Systems Engineering. Prerequisites include work in probability, statistics, linear algebra, calculus, and optimization. The program requires 30 credit hours of coursework. There is no thesis option.

The School of Industrial and Systems Engineering (ISYE) offers eight master's degrees:

- Master of Science in Industrial Engineering (MS IE);
- Master of Science in Operations Research (MS OR);
- Master of Science in Supply Chain Engineering (MS SCE);
- Master of Science in Statistics (MS STAT);
- Master of Science in Health Systems (MS HS);
- Master of Science in Quantitative and Computational Finance (MS QCF);
- Master of Science in International Logistics (MS IL) that is part of the executive program; and
- Master of Science in Computational Science and Engineering (MS CSE).

Three of these programs are interdisciplinary:

- MS QCF (joint with School of Mathematics, College of Business),
- MS STAT (joint with School of Mathematics) and
- MS SCE (joint with College of Computing, School of Mathematics).

All proposed master's degree programs require thirty semester credit hours with the exception of MS IL and MS QCF (thirty-six credit hours) and MS HS (thirty-three credit hours). None of these MS programs contains a thesis option.

A student seeking a master's degree must have a bachelor's degree and typically one earned in engineering, science, mathematics, or some other field that provides an adequate background for the successful completion of one of ISyE's programs. Students having backgrounds from unaccredited degree programs or in programs that are found lacking in relative substance can expect to first take preliminary coursework in order to elevate their preparation to the level required. The prerequisite coursework for the various master's degrees includes strong performance in probability, statistics, linear algebra, and calculus.

Every MS curriculum is based on core classes offered from the School of ISyE, as well as electives offered by ISyE and other Georgia Tech schools in engineering and science. The MS SCE, MS QCF, and MS IL are professional degree programs with separate curriculums from the other regular MS degrees.

MS Human-Integrated Systems

MS Statistics ISYE

MS Statistics Math

Program of Study

Code	Title	Credit Hours
Core Courses		
MATH 4261	Mathematical Statistics I	3
MATH 4262	Mathematical Statistics II	3
ISYE 6413	Design and Analysis of Experiments	3
ISYE 6414	Statistical Modeling and Regression Analysis	3
Statistics Electives (Select 5 courses)		**15**
MATH 4317	Analysis I	
MATH 6262	Advanced Statistical Inference I	
MATH 6263	Testing Statistical Hypotheses	
MATH 6266	Linear Statistical Models	
MATH 6267	Multivariate Statistical Analysis	
ISYE 6402	Time Series Analysis	
ISYE 6404	Nonparametric Data Analysis	
ISYE 6405	Statistical Methods for Manufacturing Design and Improvement	
ISYE 6412	Theoretical Statistics	
ISYE 6416	Computational Statistics	
ISYE 6421	Biostatistics	
ISYE 6761	Stochastic Processes I	
ISYE 6762	Stochastic Processes II	
ISYE/ MATH 6781	Reliability Theory	
ISYE/ MATH 6783	Statistical Techniques of Financial Data Analysis	
ISYE 6805	Reliability Engineering	
ISYE 7400	Advanced Design of Experiments	
ISYE 7401	Advanced Statistical Modeling	
ISYE 7405	Multivariate Data Analysis	
ISYE 7406	Data Mining and Statistical Learning	
ISYE 7441	Linear Statistical Models I	
Free Elective [1]		**3**
Total Credit Hours		**30**

[1] ISYE 6739 may not be used toward Free Elective

Master of Science in Supply Chain Engineering

The Master of Science in Supply Chain Engineering is a new professional graduate degree program created to meet the growing demand for business-savvy engineers who can design and synchronize highly complex global supply chains. The program's intensive 12-month curriculum delivers academic knowledge in analytic methods, supply chain engineering, and enterprise management while building professional practice skills and real-world industry experience.

Program applicants may come from a wide range of academic, business, and geographical backgrounds, but they will share a common motivation: to pursue a highly focused graduate education experience in supply chain engineering and to subsequently explore immediate career opportunities with global enterprises.

Program Requirements

Code	Title	Credit Hours
Analytics		
ISYE 6333	Operations Research for Supply Chain Engineering I	3
ISYE 6334	Operations Research fo Supply Chain Engineering II	3
Engineering		
ISYE 6335	Supply Chain Engineering I	3
ISYE 6336	Supply Chain Engineering II	3
ISYE 6339	Supply Chain Information Systems	3
Supply Chain Design		
ISYE 6337	Supply Chain Engineering III	3
ISYE 6338	Suppply Chain Strategy	3
Supply Chain Practice		
ISYE 6340	Supply Chain Engineering Seminar	3
ISYE 6341	Capstone Project for Supply Chain Engineering I	6
or ISYE 6342	Capstone Project for Supply Chain Engineering II	
Total Credit Hours		**30**

Practicum Track Requirements

Code	Title	Credit Hours
Analytics		
ISYE 6333	Operations Research for Supply Chain Engineering I	3
ISYE 6334	Operations Research fo Supply Chain Engineering II	3
Engineering		
ISYE 6335	Supply Chain Engineering I	3
ISYE 6336	Supply Chain Engineering II	3
ISYE 6339	Supply Chain Information Systems	3
Supply Chain Design		
ISYE 6337	Supply Chain Engineering III	3
ISYE 6338	Suppply Chain Strategy	3
Supply Chain Practice		**6**
INTN 600X	Graduate Internship Program	
ISYE 6341	Capstone Project for Supply Chain Engineering I	
or ISYE 6342	Capstone Project for Supply Chain Engineering II	
Electives		**3**
ISYE 6340	Supply Chain Engineering Seminar	
ISYE 6202	Warehousing Systems	
ISYE 6201	Manufacturing Systems	
ISYE 6501	Intro Analytics Modeling	
ISYE 6414	Statistical Modeling and Regression Analysis	
ISYE 6644	Simulation	
ISYE 6661	Linear Optimization	
ISYE 6662	Discrete Optimization	
ISYE 7203	Logistics Systems Engineering	
Total Credit Hours		**30**

BS/MS Program

A combined BS/MS program that will allow students to graduate with a Bachelor of Science in Industrial Engineering and a Master of Science in Supply Chain Engineering. Contact the School of Industrial Engineering for more information.

Master of Sustainable Energy and Environmental Management

The Master of Sustainable Energy and Environmental Management (MSEEM) curriculum is a multidisciplinary program with courses taught in schools across Georgia Tech including Public Policy, Business, City and Regional Planning, Civil and Environmental Engineering, and Economics, among others. MSEEM can be completed either full time (4-4-2 courses in a single year) or part time (2-2-1 courses each year for 2 years).

Program of Study

Code	Title	Credit Hours
Required courses		
PUBP 6312	Economics of Environmental Policy	3
PUBP 8803	Special Topics (Sustainable Energy and Environmental Management Policy and Management)	3
Professional Paper		6
Electives [1]		
Quantitative Methods		6
PUBP 6114	Applied Policy Methods and Data Analysis	
PUBP 6218	Quantitative Models in Public Policy	
PUBP 6530	Introduction to Geographic Information Systems	
PUBP 8200	Advanced Research Methods I	
PUBP 8205	Advanced Research Methods II	
PUBP 8803	Special Topics (Cost Benefit Analysis)	
PUBP 8813	Special Topics (Big Data & Public Policy)	
CETL 6490	Advanced Environmental Data Analysis	
CP 6541	Environmental Analysis Using GIS	
MGT 6203	Data Analytics in Business	
MSE 6759	Materials in Environmentally Conscious Design and Manufacturing	
Sustainable Energy & Environmental Management		9
PUBP 6300	Earth Systems	
PUBP 6310	Environmental Issues	
PUBP 6326	Environmental Values and Policy Goals	
PUBP 6327	Sustainability and Environmental Policy	
PUBP 6330	Environmental Law	
PUBP 6350	Energy Policy & Markets	
PUBP 6701	Energy Technology Policy	
PUBP 8803	Special Topics (Enviornmental Finance)	

	PUBP 8803	Special Topics (Sustainability & Environmental Policy)
	PUBP 8803	Special Topics (Smart Cities)
	PUBP 8833	Special Topics (Utility Regulation & Policy)
	AE 4803/8803	Special Topics (Energy Efficiency & Environmental Impacts)
	ARCH 6531	Environmental Systems I
	BC 6002	Issues in Sustainable Construction Technology
	BC 6731	Zero Energy Housing
	CEE 4300	Environmental Engineering Systems
	CEE 4395	Environmental Systems Design Project
	CEE 4620	Environmental Impact Assessment
	CEE 6314	Fundamentals of Environmental Modeling and Mathematics
	CEE 6345	Sustainable Engineering
	CEE 6390	Air Pollutant Formation and Control
	CEE 6625	Transportation, Energy, and Air Quality
	CEE 6790	Air Pollution Physics and Chemistry
	CHBE 4803/8803	Special Topics (Chem Eng of Energy Systems)
	CHEM 8833	Special Topics in Organic Chemistry (Fundamentals & Challenges for a Sustainable Chemical Enterprise)
	CP 6190	Introduction to Climate Change Planning
	CP 6213	Urb Env Plan & Design
	CP 6214	Environmental Planning and Impact Assessment
	CP 6217	Climate Change and the City
	CP 6233	Sustainable Urban Development
	EAS 6132	Introduction to Climate Change
	EAS 6135	Introduction to Complex Environmental Systems
	EAS 8803	Special Topics (Climate & Global Change)
	EAS 8803	Special Topics (Environmental Geochemistry)
	ECON 6380	Economics of Natural Resources and the Environment
	ECON 7032	Macroeconomics of Innovation
	HTS 6116	The Environment in World History
	INTA 8803	Special Topics (Energy & International Security)
	MGT 6369	Sustainable Business Practicum
	MGT 6359	Business Strategies For Sustainability
	ME 6759	Materials in Environmentally Conscious Design and Manufacturing
Policy & Management		3
	PUBP 6010	Ethics, Epistemology, and Public Policy
	PUBP 6012	Fundamentals of Policy Processes
	PUBP 6017	Public Management
	PUBP 6018	Policy Implementation and Administration
	PUBP 6116	Microeconomics for Policy Analysis
	PUBP 6118	Public Finance Policy
	PUBP 6201	Public Policy Analysis
	PUBP 6221	Policy and Program Evaluation
	PUBP 6314	Policy Tools for Environmental Management
	PUBP 6326	Environmental Values and Policy Goals
	PUBP 6327	Sustainability and Environmental Policy
	PUBP 6330	Environmental Law
	PUBP 6350	Energy Policy & Markets
	PUBP 6701	Energy Technology Policy
	PUBP 8540	Advanced Environmental Policy
	PUBP 8813	Special Topics (Climate Change Policy)
	CP 6223	Policy Tools for Environmental Management
	CP 6261	Environmental Law
Total Credit Hours		**30**

[1] Hours must include two (2) quantitative courses, three (3) SEEM courses, and one (1) policy & management course.

Other program guidelines:

- All courses must be taken on a letter-grade basis.
- All courses used to satisfy the course requirements must be completed with a grade of C (2.00) or better.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.

Master of Science in Urban Design (MSUD)

The Master of Science in Urban Design (MSUD) degree is oriented to those who wish to expand upon their previous professional education and professional experience, as architects, landscape architects, city planners, or civil engineers, and to enter urban design practices either in private firms or public agencies, or to pursue a Ph.D. The MSUD Program is housed in the School of Architecture and collaborates with the Georgia Tech School of City and Regional Planning. The curriculum is focused on urban design studios, often in direct collaboration with local communities, addressing contemporary challenges including climate change, equity, and retrofitting obsolescent infrastructure. Internships with leading urban design firms across the US help students build professional networks. Courses in urban design, history and theory, real estate, and urban ecology provide a rich interdisciplinary experience augmented with elective opportunities in architecture, planning, engineering, computation, public policy, heritage preservation, and other areas. Most students complete the program over the summer in our Modern Architecture and Modern City European study program, doing coursework and independent study.

Qualifications Needed to Apply

Applicants to the MSUD Program are limited to those with prior accredited professional degrees in

- Architecture (M.ARCH or B.ARCH)
- Landscape Architecture (BLA or MLA)
- City and Regional Planning (MCRP or equivalent)
- Civil Engineering (BCE or equivalent)

The MSUD Program recommends students start the 3-semester sequence in the fall semester. Students have the option of extending the program with additional coursework or an independent year-long thesis.

The course of study for the Master of Science in Urban Design (MSUD) includes a set of required core courses, totaling 30 credit hours, and professional electives, totaling 9 credit hours. The total minimum credit hour requirement for the MSUD degree is thirty-nine credit hours.

First Year		
Fall		**Credit Hours**
ARCH 7013	Urban Design Studio 1	6
BC 6975	The Evolution of a Deal	3
ARCH 6151	Theories of Urban Design	3
ARCH Elective [1]		3
	Credit Hours	**15**
Spring		
ARCH 7014	Urban Design Studio 2	6
ARCH 7151	History of Urban Form	3
ARCH 6447	Urban Ecological Design	3
ARCH Elective [1]		3
	Credit Hours	**15**
Second Year		
Fall		
Optional Second Year Fall		
ARCH 7015	Urban Design Studio 3	6
ARCH Elective [1]		3
	Credit Hours	**9**
	Total Credit Hours	**39**

Students have the option of completing requirements during Year 1 Summer with Modern Architecture Modern Cities (includes 6 hours of independent study and 6 hours of electives) or Independent Study in Atlanta.

[1] The 9 credit hours of elective courses are organized into six subject areas, reflecting important areas of urban design practice. Students will be advised to take these electives, either in concentrated areas or in distributed subjects, based on their prior professional degrees, professional experience and career interests.
These elective areas are as follows:

- **Urban Design History, Theory and Practice** electives provide depth in several aspects of urban design history, theory and practice. These are especially appropriate for students with strong technical backgrounds, who wish to engage broader aspects of urban design practice.
- **Sustainable Development** electives provide an introduction, as well as policy and technical depth, to issues of sustainable urbanism from a variety of perspectives, ranging from building to city to regional and scales.
- **Transportation Planning** electives are courses in the existing Transportation Dual Degree Program between City and Regional Planning and Civil and Environmental Engineering. Students also may enroll, with permission, in other transportation planning and design courses in the Georgia Tech School of Civil and Environmental Engineering.
- **Real Estate and Economic Development** electives provide additional depth in real estate development and economic development. Students may also cross enroll, with permission, in the Georgia State University Robinson College of Business. In addition, students may select to complete the Real Estate Certificate Program at Georgia State University.
- **Digital Media** electives respond to the rapidly growing need in urban design practice to bridge among GIS, CAD, 3-D Modeling and Animation. The strengths in the College of Design GIS Center and the Digital Buildings Laboratory provide substantial opportunities in this area, and these opportunities are expanding rapidly.
- **Heritage Preservation** electives address an area of urban design practice that has not had significant academic attention. These electives are based on opportunities for students to cross enroll, with permission, at GSU for courses in the Heritage Preservation Program in the College of Arts and Sciences. In addition, students may select to complete the Historic Preservation Certificate Program at Georgia State University.

For additional information and links see: www.arch.gatech.edu/urban-design/msud

Master of Science in Urban Analytics

The Master of Science in Urban Analytics degree is designed to give graduates a core of computing, planning, and data analysis and visualization skills to identify, analyze, and solve urban problems; to integrate those skills in an interdisciplinary way that other, single-discipline-oriented urban analytics degrees might not; and to provide depth in urban problems that can be addressed through data analytics.

The program is interdisciplinary between the School of City and Regional Planning (SCaRP, within the College of Design), the Schools of Computational Science and Engineering and Interactive Computing (CSE and IC, both within the College of Computing), and the Stewart School of Industrial and Systems Engineering (ISyE, within the College of Engineering). Each of the four units (SCaRP, IC, CSE, and ISyE) provides expertise in a different facet of urban analytics, with interdisciplinary coordination achieved by having faculty cooperate on the development and revision of course content, especially in the core and required courses.

Code	Title	Credit Hours
Urban Systems Core Courses		
CP 6552	Design of Smart Urban Systems	3
CP 8803	Special Topics in Transportation Planning (Introduction to Urban Analytics)	3

Capstone and application of urban analytics in practice		
CP 6960	Urban Analytics Capstone Project	1
CP 6962	Urban Analytics Capstone Project	5
Courses in spatial analysis		**6**
CP 6521	Advanced Geographic Information Systems	
CP 6570	Socioeconomic GIS	
CP 6541	Environmental Analysis Using GIS	
CP 6542	Transport & GIS	
Courses in computational statistics		**6**
CSE 6010	Computational Problem Solving for Scientists and Engineers	
CSE 6040	Computing for Data Analysis: Methods and Tools	
CSE 6240	Web Search and Text Mining	
CSE 6740	Computational Data Analysis: Learning, Mining, and Computation	
ISYE 6416	Computational Statistics	
ISYE 6412	Theoretical Statistics	
ISYE 6414	Statistical Modeling and Regression Analysis	
Courses in modeling and visualization		**6**
ISYE 6501	Intro Analytics Modeling	
CSE 6220	High Performance Computing	
CSE 6242	Data and Visual Analytics	
CS 6730	Data Visualization: Principles and Applications	
CS 7450	Information Visualization	
CSE/ECE 6730	Modeling and Simulation: Foundations and Implementation	
Total Credit Hours		**30**

Professional Master's in Manufacturing Leadership

Georgia Tech's Professional Master's in Manufacturing Leadership (PMML) is a collaborative effort by the colleges of engineering and business designed to prepare working engineers and scientists for manufacturing leadership roles.

Incorporating several courses from the College of Engineering's #1 graduate manufacturing program (*U.S. News & World Report, 2022*) and the Scheller College of Business, which frequently ranks in the top 10 for its MBA programs, the 10-course curriculum will provide you with the advanced technical knowledge, business acumen, and leadership skills needed to succeed in today's workforce.

In addition to the core curriculum that includes master's level engineering, you'll choose an area of concentration. Options include:

- **Forest bioproducts** – covering various aspects of the pulp and paper industry, including biorefining pathways, new biomaterials, and biotechnologies, as well as business competitive analysis and forecasting.
- **Chemical manufacturing** – centering on foundational technologies, emerging processes, and markets in the chemical processing industry.
- **Discrete manufacturing** – focusing on designing and creating products for the parts and assembly industry.

As a student in our PMML program, you'll also have access to renowned faculty who are researchers, scholars, and leaders in their fields. What's more, courses are structured so you can learn while you stay in your current job. As a result of this in-depth, comprehensive training, you will be able to:

- **Use techno-economic models** to evaluate emerging and established manufacturing technologies.
- **Ensure optimum performance of manufacturing systems** through modeling, monitoring, and quality control.
- **Design strategic visions** that guide manufacturing organizations through technological and economic changes.
- **Lead interdisciplinary decision making** using personalized management strategies.

Additional program highlights include:

- Two years total to complete, including summers
- A curriculum taught in a mostly online format, requiring three in-person sessions throughout the course of the program
- A mini-mester structure, offered each fall and spring, so you can focus on one course at a time
- Additional professional certifications in the areas of Six Sigma, project management, and supply chain
- A student cohort model that encourages collaboration and networking
- Team-based, hands-on capstone project that synthesizes what you learned

For PMML admission requirements, application deadlines, tuition detail, course descriptions, and other information, visit https://pe.gatech.edu/degrees/pmml.

Program of study

Code	Title	Credit Hours
Core Courses		
ISYE 6380	Production Planning and Control	3
ISYE 6381	Manufacturing Reliability	3
ISYE 6382	Quality Control and Six Sigma	3
MGT 6753	Principles of Management for Engineers	3
MGT 6114	Leadership Development	3
MGT 6107	Leadership and Organizational Change	3
MLDR 6800	Manufacturing Leadership Capstone Project	3
MLDR 8803	Special Topics (Supply Chain Strategy and Operations)	3
MLDR 8823	Special Topics (Future Manufacturing Technologies)	3
MLDR 8823	Special Topics (Manufacturing Project Management)	3
Total Credit Hours		**30**

Professional Master's in Occupational Safety and Health

Georgia Tech's Professional Master's in Occupational Safety and Health (PMOSH) is identified as a Qualified Academic Program (QAP) by the

Board of Certified Safety Professionals (BCSP). PMOSH is structured for working professionals with one year of industry experience. The flexible, innovative curriculum allows you to learn while you stay in your current job. Taught by distinguished faculty from academia and industry, you acquire knowledge that you can immediately apply at work.

What's more, PMOSH graduates:

- Take advantage of BCSP benefits and receive the designation as Graduate Safety Practitioner (GSP).
- Create first-rate action plans.
- Solve real-world problems through hands-on exercises, case studies, and labs.
- Analyze safety and health investment strategies and the cost/benefits of the program.

Program highlights include:

- A graduate degree in two years.
- Focus on one course at a time by taking two half-semester courses each fall and spring.
- The hybrid format that blends face-to-face instruction and 24/7 online learning.
- Live online sessions with faculty twice during each course.
- A team-based, hands-on capstone project where you receive input from, and collaborate with, an industry sponsor.
- Visit the Atlanta campus three times over two years and meet with your cohort to network, collaborate, and build community. You will also tour a well-known company to experience an established OSH program up close.

For PMOSH admission requirements, application deadlines, tuition details, course descriptions, and other info, visit pe.gatech.edu/degrees/pmosh.

To earn the PMOSH degree, students must complete ten courses.

Code	Title	Credit Hours
Required/Core Courses for PMOSH		
BCP 8803	Special Topics (Fundamentals of Occupational Safety and Health Program Management)	3
BCP 8813	Special Topics (Industrial Hygiene Principles and Health Hazards)	3
BCP 8823	Special Topics (Hazardous Materials Management)	3
BCP 8833	Special Topics (Occupational Safety and Health Principles)	3
BCP 8843	Special Topics (Advanced Safety Principles)	3
BCP 8853	Special Topics (Applied Ergonomics)	3
BCP 6700	Current Issues in Occupational Safety and Health	3
BCP 6800	Culture & Leadership Influences on Safety & Health	3
BCP 6900	Economic Analysis, Risk Management, Risk Financing, & Insurance for Safety Professionals	3
BCP 6950	Occupational Safety and Health Capstone	3
Total Credit Hours		**30**

APPLICATIONS

Admission to the Professional Master's in Occupational Safety and Health (PMOSH) program is based on an applicant's professional experience, prior education, and competencies. Please be sure to fulfill the following requirements and gather the items below before beginning the application process:

1. A bachelor's degree from an accredited school with a competitive GPA of at least 3.0.
2. Proof of English Proficiency (i.e., TOEFL). Exempted if degree was earned from a university where English is the language of instruction.
3. At least one year of professional work experience (post-Bachelor's degree) in a safety and health general industry or construction related fields.
4. Three letters of recommendation. Letters should come from past and current supervisors, outlining your skills and capabilities, and describing why you should be considered for admission.
5. A required essay/statement of purpose (no more than one page). The essay/statement of purpose should include:
   a. Why you should be considered?
   b. What experience you can bring to the program?
   c. What you expect to take away from the program to enhance your professional career?
6. A resume including work and educational experience.
7. An official transcript sent from each accredited school in which you received a degree.

Application deadline, including all supporting documents, is May 1 for the fall cohort

Professional Master's in Sustainable Electrical Energy

This master's degree is targeted to working engineers in the electrical energy and power industry. The Professional Master's in Sustainable Electrical Energy (PMSEE) program is structured to bring in students in specific cohorts. The degree features six required courses, including a culminating capstone project course, and four elective courses taken by all students in a given cohort and chosen from a selection of ten or more elective courses. Courses are organized in a sequential manner to cover in a comprehensive way the engineering content and industry emerging technologies in sustainable electrical energy. The required core for the PMSEE includes courses on power system operation and control, conventional generation, renewable energy sources, power systems economics, power system planning and reliability, and a capstone project course. Elective courses are chosen from subjects such as power system protection, power electronics, wind energy, smart grids, high voltage engineering, computational intelligence in power, solar energy, nuclear engineering and reactor engineering, fuel cell systems, and energy engineering economics and risk management.

Code	Title	Credit Hours
ECEP 6301	Power System Control and Operation	3
ECEP 8803	Special Topics (Conventional Generation) [1]	3
ECEP 8803	Special Topics (Renewable Energy Sources) [1]	3
ECEP 6304	Power Systems Economics	3
ECEP 6305	Power System Planning & Reliability	3

ECEP 6310	Capstone Project	3
Select four (4) electives from the following:		12
ECEP 6351	Power System Protection	
ECEP 8803	Special Topics (Advanced Power Electronics) [1]	
ECEP 8803	Special Topics (Smart Grids) [1]	
ECEP 8803	Special Topics (Computational Intelligence in Power) [1]	
ECEP 8803	Special Topics (Solar Energy) [1]	
ECEP 8803	Special Topics (Energy Engineering Economics and Risk Management) [1]	
ECEP 8803	Special Topics (Demand Response) [1]	
Total Credit Hours		**30**

[1] Special Topics course numbers may vary. Special Topics courses may be listed under ECEP 8803, ECEP 8813, ECEP 8823.

Professional Master's in Applied Systems Engineering

PMASE is a comprehensive system engineering program designed to give practicing engineers the mathematical, scientific, and engineering foundation to develop, deploy, and evaluate various modeling and analysis strategies. PMASE students explore these skills by engaging in real-world projects and practical examples while engaging with faculty who are practitioners in the field.

It is a rigorous graduate degree designed to build deep expertise. You will:

- Develop systems thinking skills that support employing various analytic strategies to develop a holistic perspective of the relationships among systems components and the environment.
- Develop the capacity to apply modeling and simulation to determine and apply the best modeling and simulation approaches.
- Apply Model-Based Systems Engineering (MBSE) techniques through system lifecycle.
- Assess tools and techniques, resources, organizational systems, and decision-making processes for the successful management of projects.
- Leverage skills and knowledge from PMASE program to learn and incorporate emerging systems engineering methods and technologies.
- Create a foundation for the SE Professional Certification through the International Council on Systems Engineering (ICSE).

The flexible, innovative curriculum allows you to learn while you stay in your current job. Program highlights include:

- A graduate degree in two years.
- Focus on one course at a time by taking two half-semester courses each fall and spring.
- The hybrid format that blends face-to-face instruction and 24/7 online learning.
- Mandatory live video conference sessions two to three times during the course#on#Friday (1-5 p.m.) and Saturday (10 a.m. - 5 p.m.). You will receive specific dates before starting the program via our two-year schedule.
- A team-based, hands-on capstone where you receive input from and collaborate with an industry sponsor to solve a real-world problem.
- Visit the Atlanta campus three times over two years and meet with your cohort to network, collaborate, and build community.

For PMASE admission requirements, application deadlines, tuition detail, course descriptions, and other info, visit pe.gatech.edu/degrees/pmase.

The PMASE program is a two-year program divided into core curriculum courses and complex systems courses and is delivered in a cohort model. A cohort is a group of students working towards a common degree and taking the same classes on the same schedule through completion of the degree. During the Fall Term of the cohort's second year in the program, the students select a domain elective from the options available. Currently the elective options available are in the domains of sensors systems (ASE 6111), information systems (ASE 6121) and human systems integration (ASE 6131). The prerequisite for the domain electives is ASE 6006, Systems Engineering Laboratory.

Code	Title	Credit Hours
Core Curriculum:		
ASE 6001	Fundamentals of Modern Systems Engineering	3
ASE 6002	Systems Design and Analysis	3
ASE 6003	Modeling and Simulation for Systems Engineers	3
ASE 6005	Advanced Topics in Systems Engineering: Systems Modeling with SysML	3
ASE 6006	Systems Engineering Laboratory	3
ASE 8803	Special Topics (Leadership Development)	3
Complex System Sequence:		
Domain Electives (Choose one):		3
ASE 6111	Sensor Systems Analysis and Synthesis	
ASE 6121	Information Systems Analysis and Synthesis	
ASE 6131	Analysis and Synthesis: Human Systems Integration	
ASE 6102	System of Systems and Architecture	3
ASE 6103	Complex System Lifecycle and Integration	3
ASE 6104	Complex System Design and Integration (Capstone)	3
Total Credit Hours		**30**

Minor in Aerospace Engineering

The School of Aerospace Engineering offers a minor in aerospace engineering for students majoring in all disciplines (other than AE) at Georgia Tech.

In partnership with other units on campus, the School also offers interdisciplinary minors in the areas of energy systems, and scientific and engineering computing.

The AE minor must comprise at least 15 credit hours, of which at least 9 credit hours are upper-division coursework (numbered 3000 or above). All courses counting toward the minor must be taken on a letter-grade basis and must be completed with a grade of C or higher.

AE website Minor Information

The AE minor must comprise at least 15 credit hours, of which at least 9 credit hours are upper-division coursework (numbered 3000 or above). All courses counting toward the minor must be taken on a letter-grade basis and must be completed with a grade of C or higher.

Program of Study

Code	Title	Credit Hours
Required Courses		
AE 2010	Thermodynamics & Fluids Fundamentals	4
AE 3030	Aerodynamics	4
AE 3330	Introduction to Aerospace Vehicle Performance	3
Elective Courses		
Select elective AE courses to fulfill 15 credit hour requirement [1]		4
Total Credit Hours		**15**

Guidelines and Exceptions

A. A maximum of 3 credit hours of AE 3355/AE 4355 may be applied to satisfy the Minor.

B. Maximum of 1 credit hour of research credit (AE 2699/AE 4699) may be used.

C. No more than 6 credit hours of Special Topics courses may be included.

D. If one credit hour research is taken, then only 5 credit hours of Special Topics is allowed.

E. No Special Problems or Internship coursework may be used.

F. Students may not use AE 3515 to satisfy their Minor requirements if they use ME 3015 or ECE 3085 to satisfy their Major requirements.

G. A maximum of 3 semester hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.

H. It is the major advisor's responsibility to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in Architecture

The School of Architecture offers an undergraduate minor in Architecture for students in all disciplines at Georgia Tech. Students in the minor will learn to produce models for concrete solutions to "real-world sustainability problems" (social and ecological) and ones for handling complex, multidisciplinary collaboration.

Interested students should see the Minors Guidelines and consult with an academic advisor for more details.

Program of Study

Code	Title	Credit Hours
ARCH 3115	Modern Arch and Art Workshop	3
ARCH 2111	History of Architecture I	3
or ARCH 21	History of Architecture II	
ARCH 3231	Environmental Systems and Design Integration I	3
or ARCH 22	Construction Technology and Design Integration I	
ARCH 4515	Collaborative Design Workshop	3
Electives		
Advisor-Approved Elective		3
Total Credit Hours		**15**

- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- All courses counting toward the minor must be taken on a letter-grade basis and must be completed with a grade of C (2.00) or better.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in African Studies

This interdisciplinary minor connects studies of all African regions (North, West, Central, East, South)—their languages, their cultures, and their peoples, both concurrently in their national and international relationships as well as longitudinally over the course of history.

The African Studies minor is offered jointly by the Schools of Economics; Literature, Media, and Communication; Modern Languages; Public Policy and the Sam Nunn School of International Affairs.

Through the interdisciplinary study of economics, politics (domestic and international), public policy, literature, media, languages and area studies of these regions and populations, students engage in comparative study of societies, values, and local/global issues.

This minor is designed for undergraduates who will enter a wide range of careers that can lead directly or indirectly to interactions with the people, the social organizations and businesses, and governments of Africa, both abroad and in the U.S.

Students wishing to pursue this minor should declare the minor by filling out the minor change form with the Student Advisor in Modern Languages.

Minor Program of Study & Guidelines

Modern Language Minor Information

General minor guidelines:

- A maximum of six credit hours of Special Topics (with more than 50% on Africa & African diasporas) is allowed.

- All courses must be taken on a letter-grade basis and a grade of C or better must be received in each course.
- No more than six credit hours of coursework can be completed at another university, and the African Studies minor advisor or the ADUS or DUS in Modern Languages must approve this.
- It is the major advisor's responsibility to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.
- Study Abroad and Internship Courses may be approved by the African Studies minor advisor or the ADUS or DUS in Modern Languages if they take place in Africa and/or include topics related to Africa and its diasporas. A community internship in Atlanta or elsewhere is also a fine option when related to African-American or African diaspora issues and topics.
- There are no prerequisites for ML courses (placement tests and other tools are used instead).

Requirements

Code	Title	Credit Hours
Required Course		
ARBC/FREN/ PORT/SWAH/ WOLO 3420	Introduction to Africa	3
Electives		**12**
Total Credit Hours		**15**

1 The four electives must include at least two language courses (6 credits) in the same target language at the 1000-level or above in Arabic, French, Portuguese, Swahili, or Wolof. Students may take more than two courses from this list and satisfy up to all four elective courses (12 credits) in this way. Students can count courses in up to two different languages. Only six credits of 1000-/2000-level courses may be counted for the minor (see the table (A-list courses) below).

2 The elective courses may include up to two courses (6 credits) in English on topics related to African, African-American and other African diasporas studies. These courses include but are not limited to the course list in B.1 in the table below.

3 A student may substitute one English course from the course list in B.1 in the table below with one course (3 credits) on topics related to topics and skills essential to understanding Africa and working in Africa. These courses include but are not limited to the courses list in B.2 in the table below.

Code	Title	Credit Hours
A-course list		
Courses in Foreign Languages (minimum of 6 credits in the same language; maximum of 12 credits across one or two languages). Reminder: only six credits of 1000/2000-level coursework can count toward the African Studies minor.		
Arabic [1]		
ARBC 1001	Elementary Arabic I	4
ARBC 1002	Elementary Arabic II	4
ARBC 2001	Intermediate Arabic I	3
ARBC 2002	Intermediate Arabic II	3
ARBC 3001	Advanced Arabic I	3
ARBC 3002	Advanced Arabic II	3
ARBC 3005	Contemporary Arab Culture	3
ARBC 3691	Intensive Advanced Arabic	3
ARBC 3692	Arabic for Business and Technology I	3
ARBC 3693	Arabic for Business and Technology II	3
ARBC 4694	Internship Assistantship	1-21
ARBC 4695	Arabic Internship	1-3
ARBC 4698	Research Assistantship	1-12
ARBC 4699	Undergraduate Research	1-12
ARBC 4813	Special Topics	3
ARBC 4823	Special Topics	3
ARBC 4833	Special Topics	3
ARBC 4901	Special Problems	1-21
ARBC 4902	Special Problems	1-21
French [2]		
FREN 1001	Elementary French I	3
FREN 1002	Elementary French II	3
FREN 2001	Patterns of French Culture I	3
FREN 2002	Patterns of French Culture II	3
FREN 4064	Sustainability & Development in the Francophone World	3
FREN 4101	Literature of the Francophone World I	3
FREN 4102	Literature of the Francophone World II	3
FREN 4103	Francophone Africa	3
FREN 4105	Francophone Cinema	3
FREN 4107	The African Diasporas in France	3
Portuguese [3]		
PORT 1001	Elementary Portuguese I	3
PORT 1002	Elementary Portuguese II	3
PORT 1501	Heritage Portuguese I	3
PORT 2001	Intermediate Portuguese I	3
PORT 2002	Intermediate Portuguese II	3
PORT 2501	Heritage Portuguese II	3
Swahili [4]		
SWAH 1001	Elementary Swahili I	4
SWAH 1002	Elementary Swahili II	4
SWAH 1501	Heritage Swahili I	4
SWAH 2001	Intrmediate Swahili I	3
SWAH 2002	Intermediate Swahili II	3
SWAH 2501	Heritage Swahili II	3
Wolof [5]		
WOLO 1001	Elementary Wolof I	3
WOLO 1002	Elementary Wolof II	3
WOLO 2001	Intermediate Wolof I	3
WOLO 2002	Intermediate Wolof II	3

1 Students may count any other 3000/4000-level Arabic course(s) not listed above with approval from the African Studies minor advisor or the ADUS or DUS in Modern Languages.

[2] Students may count any other 3000/4000-level French course(s) not listed above when taught with 50% or more content on Africa with approval from the African Studies minor advisor or the ADUS or DUS in Modern Languages.

[3] Students may count any other 3000/4000-level Portuguese course(s) when taught with 50% or more content on Africa with approval from the African Studies minor advisor or the ADUS or DUS in Modern Languages.

[4] Students may count any 3000/4000-level Swahili courses.

[5] Students may count any 3000/4000-level Wolof courses.

Code	Title	Credit Hours
B.1 Course List [1]		
Courses in English related to African, African-American and other African diasporas studies and issues (Up to six credits from B.1)		
ARBC 1501	Understanding Arab Culture	3
ARBC 2301	Arabic Arts, Science and Technology Through History	3
ARBC 3501	Men-Women In Islam	3
INTA 3240	Government and Politics of Africa	3
LMC 3208	African American Literature and Culture	3
ML 2500	Think Globally, Act Locally: An Introduction to Cross-Cultural Studies	3
PUBP 3214	African American Politics	3

[1] Students may count any other (non-ML) IAC course(s) not listed in B.1 below when taught with 50% or more content on African, African-American and other African diasporas studies and issues (Up to six credits from B.1) with approval from the African Studies minor advisor or the ADUS or DUS in Modern Languages.

Code	Title	Credit Hours
B.2 Course List [1]		
Courses in English Related to Topics and Skills essential to understanding Africa and working in Africa (Up to three credits from B.2)		
ECON 4350	International Economics	3
ECON 4411	Economic Development	3
ECON 4415	Conflict and Security in Developing Countries	3
INTA 2050	Intro to Global Development	3
INTA 3303	Political Economy of Development	3
INTA 4241	Democracy in the Global South	3
LMC 3210	Ethnicity in American Culture	3
LMC 3214	Science Fiction	3
LMC 3257 & 3257R	Global Cinema and LMC 3257 Recitation	3
LMC 3306	Science, Technology, and Race	3
PUBP 3520	Globalization and Public Policy	3

[1] Students may count any other (non-ML) IAC course not listed in B.2 below and related to topics and skills essential to understanding Africa and working in Africa (Up to three credits from B.2) with approval from the African Studies minor advisor or the ADUS or DUS in Modern Languages.

Minor in Air Force Leadership Studies

The minor will familiarize the student with entry level concepts of military leadership with an emphasis on Air Force & Space Force history, technology, and organization.

Code	Title	Credit Hours
AS 1110	Foundations of the Air Force I	1
AS 1120	Foundations of the Air Force II	1
AS 2210	Evolution of U.S. Air and Space Power I	1
AS 2220	Evolution of U.S. Air and Space Power II	1
AS 3310	Leadership Studies I	3
AS 3320	Leadership Studies II	3
AS 4410	National Security Affairs	3
AS 4420	Preparation for Active Duty	3
Total Credit Hours		**16**

- A minimum of 9 credit hours of upper-division coursework must constitute the required 16 credit hours of minor course work.
- Students may not repeat any course for double credit.
- All AS courses must be completed with a C letter grade or greater.
- Cumulative GPA in the AS Courses must be a 2.0 or greater.

Minor in Biology

A minor in biology is available to all non-biology majors. The minor program provides a concentration in modern biological sciences and is especially valuable for students considering biomedical or environmental fields. The basic requirement is fifteen semester hours in biology, of which nine hours must be at the 3000 level or higher. Further information is available from the School's undergraduate coordinator.

Minor Program of Study & Guidelines

Program of Study

Code	Title	Credit Hours
Select 15 hours of Biology electives [1]		15
Total Credit Hours		**15**

[1] Nine credit hours must be 3000-level or higher

- Biology electives includes any BIOS-prefix coursework with some restrictions as noted below:
- A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or Undergraduate Research or Biology TA Experience or Biology Internship. Students may not use 6 credit hours of either Special Problems or Undergraduate Research or Biology TA Experience or Biology Internship for a minor.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- All courses counting toward the minor must be taken on a letter-grade basis and must be completed with a grade of C (2.00) or better.

- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in Biomedical Engineering

The goal of the minor program is to educate students in how to apply engineering fundamentals to solve problems in biology and medicine. The program should be of particular interest to those students who plan to pursue advanced degrees in biomedical engineering and/or medicine.

Minor Program of Study & Guidelines

Program of Study

The Biomedical Engineering minor must comprise at least 15 credit hours, of which at least 9 credit hours are upper-division coursework (numbered 3000 or above).

Code	Title	Credit Hours
Required Courses		
Choose one:		3
BIOS 3753	Fundamentals of Human Anatomy	
BMED 3100	Systems Physiology	
Biosciences		
Select at least one of the following:		3
BIOS 4100	Exercise Physiology	
BIOS 4200	Kinesiological Basis of Human Movement	
BIOS 3755	Human Physiology	
BIOS 1107	Biological Principles	
BIOS 2600	Genetics	
BIOS 4570	Immunology	
CHEM 3511	Survey of Biochemistry	
CHEM 4511	Biochemistry I	
CHEM 4512	Biochemistry II	
Biomedical Engineering		
Select at least 9 credit hours from the following:		9
BMED/ME 4757	Biofluid Mechanics	
BMED/ME 4758	Biosolid Mechanics	
BMED 4400	Neuroengineering Fundamentals	
BMED 4477	Biological Networks and Genomics	
BMED 4500	Cell and Tissue Engineering Laboratory	
BMED 4783	Introduction to Medical Image Processing	
BMED/ CHBE/ CHEM 4765	Drug Design, Development and Delivery	
BMED/ECE 4783	Introduction to Medical Image Processing	
BMED/ECE 4784	Engineering Electrophysiology	
BMED 4751	Introduction to Biomaterials	
BMED 4750	Diagnostic Imaging Physics	
BMED/ CHBE/ ECE/ME 4781	Biomedical Instrumentation	
BMED/ CHBE/ ECE/ME 4782	Biosystems Analysis	
Total Credit Hours		**15**

- A maximum of 6 creditr hours of approved Special Topics courses may be included in a minor program.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- All courses counting toward the minor must be taken on a letter-grade basis and must be completed with a grade of C (2.00) or better.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in Chemistry and Biochemistry

The School of Chemistry and Biochemistry provides many courses that are of interest to students from the Schools of Biological Sciences, Chemical and Biomolecular Engineering, Materials Science and Engineering, and Biomedical Engineering, and students pursuing pre-health requirements. The Minor in Chemistry and Biochemistry provides a structured means to enhance chemical knowledge and a multi-disciplinary approach to problem-solving. Documentation of the additional courses may benefit students as they enter a competitive, global, and diverse workforce.

The minor is likely to be attractive to students applying to medical, pharmacy, dental, and graduate schools.

All students must meet Institute minor requirements

Code	Title	Credit Hours
Required courses: [1,2,3]		
CHEM 2311	Organic Chemistry I	3
CHEM 2312	Organic Chemistry II	3
or CHEM 2318	Organic and Bioorganic Chemistry	
CHEM 3511	Survey of Biochemistry [7]	3
or CHEM 4511	Biochemistry I	
or CHEM 3512	Biochemistry I	
Select six (6) credit hours:		**6**

CHEM 3111	Inorganic Chemistry	
CHEM 3411	Physical Chemistry I	
CHEM 3412	Physical Chemistry II	
CHEM 3481	Physical Chemistry Laboratory I	
CHEM 3700	The Science of Alternative Energy	
CHEM 4113	Applications of Inorganic Chemistry in Current Energy Research	
CHEM 4311	Advanced Organic Chemistry	
CHEM 4341	Applied Spectroscopy	
CHEM 4452	Chemistry of the Solid State	
CHEM 4485	Computational Chemistry	
CHEM 4512	Biochemistry II	
or CHEM	Biochemistry II	
CHEM 4521	Biophysical Chemistry	
CHEM 4740	Atmospheric Chemistry	
CHEM 4760	Biocatalysis and Metabolic Engineering	
CHEM 4765	Drug Design, Development, and Delivery	
CHEM 4775	Polymer Science and Engineering I: Formation and Properties	
CHEM 4776	Polymer Science and Engineering II: Analysis, Processing, and Laboratory	
CHEM 4803	Special Topics (with approval of the director of undergraduate studies)	
Total Credit Hours		**15**

[1] If the student's major degree program requires the use of one of these courses (CHEM 2311, CHEM 2312, CHEM 2313, CHEM 3511, and/or CHEM 4511 and/or CHEM 3521) and that course is not released towards the minor, the student may substitute it with one of the courses listed below.

[2] Credit only allowed for one of CHEM 3511, CHEM 4511, and CHEM 3521

[3] Credit not allowed for both CHEM 2312 and CHEM 2313

Minor in Chinese

The School of Modern Languages offers minors in seven languages: Chinese, French, German, Japanese, Korean, Russian and Spanish. This program is designed for students of all majors who wish to develop their language skills to at least an intermediate level. The language minor demonstrates to future employers and graduate programs a sustained commitment to language and culture studies. Some language minors also welcome heritage and native speakers.

Students with previous language study who pursue a language minor can take advantage of our Advanced Standing policy to potentially earn up to 8 credits of lower-level language (1001, 1002, 2001, and/or 2002) that can count towards Core Area C or free electives and/or up to 3 credits (2002) that can count toward the language minor in Chinese, Japanese, Korean, or Russian.

The School of Modern Languages offers faculty-led study abroad programs in these language as well as our signature Language for Business and Technology (LBAT) summer abroad programs that allow students to complete up to 12 credits toward the 15-credit minor in one semester.

In addition to these seven language minors, we also a minor in Linguistics and five area studies minors: African Studies; East Asian Studies; International Business, Language, and Culture; Middle Eastern and North African Studies; Latin American and LatinX Studies.

Students interested in further advancing their language skills and intercultural competence beyond the minor, are encouraged to consider adding Applied Languages and Intercultural Studies (ALIS) as a double major, which requires only 4 to 5 more upper-level language classes than the minor. The ALIS degree is Georgia Tech's equivalent of a foreign-language major in Chinese, French, German, Japanese, Korean, Russian, or Spanish.

Students wishing to pursue one or more of these minors should declare the minor by filling out the minor change form with the Director of Undergraduate Studies in Modern Languages.

Minor Program of Study & Guidelines

Modern Language Minor Information

Program of Study

Code	Title	Credit Hours
Select 15 hours of Chinese electives [1,2,3]		15
Total Credit Hours		**15**

[1] Must be 2002 (or, equivalent-see advisor), 3000-, or 4000-level courses in Chinese.

[2] At least twelve credit hours must be 3000-level or higher.

[3] Three (3) hours of CHIN 34XX may be counted among the total hours for the minor.

- A maximum of 9 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- All courses counting toward a minor must be taken on a letter-grade basis, and a grade of C or better must be received in each course.
- A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or CHIN 2699 or CHIN 4699. Students may not use 6 credit hours of either Special Problems or CHIN 2699 CHIN 2699 CHIN 2699 or CHIN 4699 for a minor.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor

Minor in Computational Data Analysis

The Computational Data Analysis minor will provide students with the necessary mathematical and statistical background to develop and apply various data analysis techniques to real world datasets. The minor has three main objectives related to knowledge, skills, and application:

1. provide students with foundational knowledge of topics such as probability and statistics, algorithms and data structures to solve data analysis problems arising in practical applications,
2. develop students' skill in software development techniques using one or more high level programming languages relevant to data analytics,
3. enable students to effectively apply computational methods to solve exemplar data analysis problems arising in relevant applications.

Minor Program of Study & Guidelines

Program of Study

This minor must comprise at least 15 credit hours, of which at least 9 credit hours are upper-division coursework (numbered 3000 or above).

Code	Title	Credit Hours
Prerequisite		
CS 1331	Introduction to Object Oriented Programming [1]	
Required Courses		
CX 4240	Introduction to Computing for Data Analysis	3
CX 4242	Data and Visual Analytics	3
Probability and Statistics		
Select one of the following:		3
MATH 3215	Introduction to Probability and Statistics	
MATH 3225	Honors Probability and Statistics	
ECE 3077	Prob/Stats for ECE	
ISYE 2027	Probability with Applications	
Computational Methods		
Select one of the following:		3
CX 4010	Computational Problem Solving for Scientists and Engineers	
CS 4400	Introduction to Database Systems	
CS 4460	Introduction to Information Visualization	
Electives		
Select one of the following:		3
BIOL 4150	Genomics and Applied Bioinformatics	
CEE 3010	Geomatics	
CS 3630	Introduction to Perception and Robotics	
CS 4400	Introduction to Database Systems	
CS 4460	Introduction to Information Visualization	
CS 4495	Computer Vision	
CX 4010	Computational Problem Solving for Scientists and Engineers	
CS 4803	Special Topics (Computational Sustainability)	
EAS 4430	Remote Sensing and Data Analysis	
EAS 4480	Environmental Data Analysis	
ECE 4270	Fundamentals of Digital Signal Processing	
ECE 4560	Introduction to Automation and Robotics	
ECE 4580	Computational Computer Vision	
ECE 4823	Special Topics (Game Theory and Multi-agent Systems)	
ISYE 4311	Capital Investment Analysis	
ISYE 3232	Stochastic Manufacturing and Service Systems	
MGT 4067	Financial Markets: Trading and Structure	
MGT 4068	Fixed Income	
PSYC 4031	Applied Experimental Psychology	
Total Credit Hours		**15**

[1] CS 1331 prerequisite for the minor required (this course **does NOT** count toward the 15 credit hours required for minor) and a grade of A or B is required

- A CS Minor application is required
- No Special Problems or Internship coursework may be used towards the CS minor.
- All minor courses must be completed with a grade of C or higher.
- A maximum of 6 credit hours of Special Topics courses may be included in a minor.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in Computing and Business

The Scheller College of Business and the College of Computing offer the competitive-admission computing & business minor through the Denning Technology & Management (T&M) Program. It is a course of study that enables computing and IT management business undergraduate students to learn one another's language through innovative coursework and interdisciplinary team projects focused on solving real-world problems presented by T&M's corporate affiliates.

The minor in computing & business curriculum requires completing 22 semester credit hours after being accepted to the T&M Program. T&M accepts applications each October.

Admission information is available at: https://www.scheller.gatech.edu/centers-and-initiatives/steven-a-denning-tech-and-management-program/admissions.html

Course requirements are available at: https://www.scheller.gatech.edu/centers-and-initiatives/steven-a-denning-tech-and-management-program/curriculum.html

GPA Requirements

The minimum, cumulative GPA required for applicants to the Denning T&M Program is 3.0 based on a minimum of 12 hours earned at Georgia Tech. In order for accepted students to maintain their eligibility to remain in the T&M Program, they must continue to maintain a minimum, cumulative GPA of 2.9 and maintain a minimum 3.0 GPA for the classes required by the Denning T&M curriculum. All courses used to satisfy the requirements of the minor must be taken for a letter grade; pass/fail credit is not allowed and must be completed with the grade of C (2.00) or better.

Program of Study - Business Administration Students Track

Code	Title	Credit Hours
Required Courses		
CS 1331	Introduction to Object Oriented Programming	3
CS 2316	Data Manipulation for Science and Industry	3
CS 2340	Objects and Design	3
CS 3743	Analysis of Emerging Technologies	3
CS 3744	Managing Product, Service & Technology Development	3
CS 4741	Integrative Management Development-Project Preparation	3
CS 4742	Integrated Computing and Management Capstone Project	4
Total Credit Hours		**22**

Application and course descriptions are available at: http://scheller.gatech.edu/centers-initiatives/technology-management-program/index.html

Program of Study - Computer Science and Computational Media Students Track

Code	Title	Credit Hours
MGT 3000	Financial and Managerial Accounting	3
MGT 3078	Finance and Investments	3
or MGT 306	Financial Management	
MGT 3300	Marketing Management I	3
MGT 3743	Analysis of Emerging Technologies	3
MGT 3744	Managing Product, Service & Technology Development	3
MGT 4741	Integrative Management Development-Project Preparation	3
MGT 4742	Integrated Technology and Management Capstone Project	4
Total Credit Hours		**22**

Minor in Computing and Devices

Minor in Computing

For those students majoring in disciplines other than computer science who wish to gain a deeper understanding of computing and its applications, the College of Computing offers the minor in computer science. Click here for additional information.

- Computing & Media
- Computing & People
- Computing & Intelligence
- Computing & Devices
- Computing & Information Internetworks
- Computing & Systems and Architecture
- Computing & Theory

Minor Program of Study & Guidelines

Program of Study

The Computing: Devices minor must comprise at least 17 credit hours of computer science coursework of which at least 9 credit hours must be at the 3000 level or higher.

A CS Minor application is required.

Code	Title	Credit Hours
Prerequisite		
CS 1331	Introduction to Object Oriented Programming [1]	
Required Courses		
CS 2110	Computer Organization and Programming [2]	4
CS 2200	Computer Systems and Networks	4
CS 3251	Computer Networking I	3
Select one of the following sequences: [3]		6
CS 3651	Prototyping Intelligent Devices (and one CS course from Devices in the Real World) [3]	
One CS 3000/4000 level course from one of the elective categories in the Devices Thread.		
Total Credit Hours		**17**

1. CS 1331 prerequisite for the minor required (this course **does NOT** count toward the 17 credit hours required for minor) and a grade of A or B is required
2. ECE students with credit for ECE 2035 and either ECE 2020 or ECE 2030 may substitute one CS 3000/4000 level Intelligence Thread course for CS 2110 and complete the minor with 16 hours instead of 17.
3. Numbered 3000 or above.

- No Special Problems or Internship coursework may be used towards the CS minor.
- A grade of A or B is required for CS 1301/CS 1315/CS 1371 and CS 1331. All other minor courses must be completed with a grade of C or higher.
- Only CS courses are included in the minor.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the **major advisor's responsibility** to verify that students are not using any courses required by name and number for their major, that they are not using any core area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Free electives may be used towards minors.

Minor in Computing Information Internetworks

Minor in Computing

For those students majoring in disciplines other than computer science who wish to gain a deeper understanding of computing and its

applications, the College of Computing offers the minor in computer science. Click here for additional information.

- Computing & Media
- Computing & People
- Computing & Intelligence
- Computing & Devices
- Computing & Information Internetworks
- Computing & Systems and Architecture
- Computing & Theory

Minor Program of Study & Guidelines

Program of Study

Code	Title	Credit Hours
Prerequisite		
CS 1331	Introduction to Object Oriented Programming [1]	
Required Courses		
CS 2110	Computer Organization and Programming [2]	4
CS 2200	Computer Systems and Networks	4
CS Electives		
Select 9 credit hours of electives, at least 6 of which are upper-divison. [3]		9
Total Credit Hours		**17**

1. CS 1331 prerequisite for the minor required (this course **does NOT** count toward the 17 credit hours required for minor) and a grade of A or B is required
2. ECE students with credit for ECE 2035 and either ECE 2020 or ECE 2030 may substitute one CS 3000/4000 level Information Internetworks Thread course for CS 2110 and complete the minor with 16 credit hours instead of 17.
3. Numbered 3000 or above

- A CS Minor application is required.
- No Special Problems or Internship coursework may be used towards the CS minor.
- A grade of A or B is required for CS 1301/CS 1315/CS 1371 and CS 1331. All other minor courses must be completed with a grade of C or higher.
- Only CS courses are included in the minor.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.

Minor in Computing and Intelligence

Minor in Computing

For those students majoring in disciplines other than computer science who wish to gain a deeper understanding of computing and its applications, the College of Computing offers the minor in computer science. Click here for additional information.

- Computing & Media
- Computing & People
- Computing & Intelligence
- Computing & Devices
- Computing & Information Internetworks
- Computing & Systems and Architecture
- Computing & Theory

Minor Program of Study & Guidelines

Program of Study

The Computer Science – Intelligence track minor must comprise at least 16 semester hours of computer science coursework of which at least 9 hours must be at the 3000 level or higher.

Code	Title	Credit Hours
Prerequisite		
CS 1331	Introduction to Object Oriented Programming [1]	
Required Courses		
CS 1332	Data Structures and Algorithms for Applications	3
CS 2110	Computer Organization and Programming	4
CS 3600	Introduction to Artificial Intelligence	3
Select one CS course each from the following:		6
Embodied Intelligence		
Approaches to Intelligence		
Total Credit Hours		**16**

1. Prerequisite must be taken but **is not** included in the required 16 hours.

- CS Minor application is required.
- ECE students with credit for ECE 2035 and either ECE 2020 or ECE 2030 may substitute one CS 3000/4000 level Intelligence Thread course for CS 2110 and complete the minor with 15 hours instead of 16.
- No Special Problems or Internship coursework may be used towards the CS minor.
- A grade of A or B is required for CS 1301/CS 1315/CS 1371 and CS 1331. All other minor courses must be completed with a grade of C or higher.
- Only CS courses are included in the minor.
- It is the **major advisor's responsibility** to verify that students are not using any courses required by name and number for their major, that they are not using any core area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Free electives may be used towards minors.

- A maximum of 3 semester hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.

Minor in Computing and Media

Minor in Computing

For those students majoring in disciplines other than computer science who wish to gain a deeper understanding of computing and its applications, the College of Computing offers the minor in computer science. Click here for additional information.

- Computing & Media
- Computing & People
- Computing & Intelligence
- Computing & Devices
- Computing & Information Internetworks
- Computing & Systems and Architecture
- Computing & Theory

Minor Program of Study & Guidelines

Program of Study

The Computer Science – Media track minor must comprise at least 19 credit hours of computer science coursework of which at least 9 credit hours must be at the 3000 level or higher.

Code	Title	Credit Hours
Prerequisite		
CS 1331	Introduction to Object Oriented Programming [1]	
Required Courses		
CS 1332	Data Structures and Algorithms for Applications	3
CS 2110	Computer Organization and Programming [2]	4
or CS 2261	Media Device Architectures	
CS 2340	Objects and Design	3
CS 3451	Computer Graphics	3
Select two CS courses from Media Technologies.		6
Total Credit Hours		**19**

1 CS 1331 prerequisite for the minor required (this course **does NOT** count toward the 19 credit hours required for minor) and a grade of A or B is required

2 ECE students with credit for ECE 2035 and either ECE 2020 or ECE 2030 may substitute one CS 3000/4000 level Information Internetworks Thread course for CS 2110 and complete the minor with 18 credit hours instead of 19.

- A CS Minor application is required.
- No Special Problems or Internship coursework may be used towards the CS minor.
- A grade of A or B is required for CS 1301/CS 1315/CS 1371 and CS 1331. All other minor courses must be completed with a grade of C or higher.
- Only CS courses are included in the minor.
- It is the **major advisor's responsibility** to verify that students are not using any courses required by name and number for their major, that they are not using any core area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Free electives may be used towards minors
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.

Minor in Computing and People

Minor in Computing

For those students majoring in disciplines other than computer science who wish to gain a deeper understanding of computing and its applications, the College of Computing offers the minor in computer science. Click here for additional information.

- Computing & Media
- Computing & People
- Computing & Intelligence
- Computing & Devices
- Computing & Information Internetworks
- Computing & Systems and Architecture
- Computing & Theory

Minor Program of Study & Guidelines

Program of Study

The Computing: People minor must comprise at least 15 credit hours of computer science coursework of which at least 9 credit hours must be at the 3000 level or higher.

Code	Title	Credit Hours
Prerequisite		
CS 1331	Introduction to Object Oriented Programming [1]	
Required Courses		
CS 1332	Data Structures and Algorithms for Applications	3
CS 2340	Objects and Design	3
CS 3750	Human Computer Interface Design and Evaluation	3
Select two CS courses from Human-Centered Technology.		6
Total Credit Hours		**15**

1 CS 1331 prerequisite for the minor required (this course **does NOT** count toward the 15 credit hours required for minor) and a grade of A or B is required

- A CS Minor application is required.
- No Special Problems or Internship coursework may be used towards the CS minor.
- A grade of A or B is required for CS 1301/CS 1315/CS 1371 and CS 1331. All other minor courses must be completed with a grade of C or higher.
- Only CS courses are included in the minor.

- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in Computing and Systems Architecture

Minor in Computing

For those students majoring in disciplines other than computer science who wish to gain a deeper understanding of computing and its applications, the College of Computing offers the minor in computer science. Click here for additional information.

- Computing & Media
- Computing & People
- Computing & Intelligence
- Computing & Devices
- Computing & Information Internetworks
- Computing & Systems and Architecture
- Computing & Theory

Minor Program of Study & Guidelines

Program of Study

The Computing: Systems and Architecture minor must comprise at least 17 credit hours of computer science coursework of which at least 9 hours must be at the 3000 level or higher.

Code	Title	Credit Hours
Prerequisite		
CS 1331	Introduction to Object Oriented Programming [1]	
Required Courses		
CS 2110	Computer Organization and Programming [2]	4
CS 2200	Computer Systems and Networks	4
CS 3210	Design of Operating Systems	3
CS 3220	Computer Structures: Hardware/Software Codesign of a Processor	3
Select one 3000-level or higher course from the following:		3
Systems Software Tools		
Advanced Systems & Architecture		
Total Credit Hours		**17**

1 CS 1331 prerequisite for the minor required (this course **does NOT** count toward the 17 credit hours required for minor) and a grade of A or B is required

2 ECE students with credit for ECE 2035 and either ECE 2020 or ECE 2030 may substitute one CS 3000/4000 level Information Internetworks Thread course for CS 2110 and complete the minor with 16 credit hours instead of 17.

- A CS Minor application is required.
- No Special Problems or Internship coursework may be used towards the CS minor.
- A grade of A or B is required for CS 1301/CS 1315/CS 1371 and CS 1331. All other minor courses must be completed with a grade of C or higher.
- Only CS courses are included in the minor.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.

Minor in Computing and Theory

Minor in Computing

For those students majoring in disciplines other than computer science who wish to gain a deeper understanding of computing and its applications, the College of Computing offers the minor in computer science. Click here for additional information.

- Computing & Media
- Computing & People
- Computing & Intelligence
- Computing & Devices
- Computing & Information Internetworks
- Computing & Systems and Architecture
- Computing & Theory

Minor Program of Study & Guidelines

Program of Study

The Computing: Theory minor must comprise at least 15 credit hours of computer science coursework of which at least 9 hours must be at the 3000 level or higher.

Code	Title	Credit Hours
Prerequisite		
CS 1331	Introduction to Object Oriented Programming [1]	
Required Courses		
CS 1332	Data Structures and Algorithms for Applications	3
CS 2050	Introduction to Discrete Mathematics for Computer Science	3

or CS 2051	Honors - Induction to Discrete Mathematics for Computer Science	
CS 3510	Design and Analysis of Algorithms	3
or CS 3511	Design and Analysis of Algorithms, Honors	
CS 4510	Automata and Complexity Theory	3
CS 4540	Advanced Algorithms	3
Total Credit Hours		**15**

[1] CS 1331 prerequisite for the minor required (this course **does NOT** count toward the 15 credit hours required for minor) and a grade of A or B is required

- A CS Minor application is required.
- No Special Problems or Internship coursework may be used towards the CS minor.
- A grade of A or B is required for CS 1301/CS 1315/CS 1371 and CS 1331. All other minor courses must be completed with a grade of C or higher.
- Only CS courses are included in the minor.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in Earth and Atmospheric Sciences

The School of Earth and Atmospheric Sciences offers a minor with seven different tracks. These specific tracks are designed to give non-majors a background in the environmental and global change issues that face the world. This background both allows a broader exposure and gives a strategic background for many careers. The seven tracks are:

- Climate Change
- Earth System Physics
- Environmental Chemistry
- Environmental Science
- Geophysics
- Meteorology
- Ocean Sciences

Minor Program of Study & Guidelines

EAS Minor Information

Program of Study - Climate Change Track

The EAS minor with a Climate Change track is for students in majors outside of EAS who have an interest in understanding Climate Change and Issues surrounding it. Prerequisites required for some of the classes listed below. **This minor must comprise at least 15 credit hours, of which at least 9 credit hours are upper-division coursework (numbered 3000 or above).**

Code	Title	Credit Hours
Required Courses		
EAS 2750	Physics of the Weather	3
EAS 4410	Climate and Global Change	3
Electives		
Select three electives with a minimum of 3 credit hours from each of the following areas:		9
EAS Electives		
Electives		
Total Credit Hours		**15**

EAS Electives

Code	Title	Credit Hours
EAS 3110	Energy, Environment, and Society	3
EAS 3620	Geochemistry	4
EAS 4350	Paleoclimatology and Paleoceanography	3
EAS 4655	Atmospheric Dynamics	3
EAS 4656	Atmospheric Dynamics Practicum	1
EAS 4670	Atmospheric Dynamics II	3
EAS 4699	Undergraduate Research [1]	3
EAS 4740	Atmospheric Chemistry Laboratory	3

[1] A maximum of 3 credit hours of EAS 4699 may be included in the EAS minor program.

Approved Electives

Code	Title	Credit Hours
ECON 2101	The Global Economy	3
ECON 4440	Economics of Natural Resources and the Environment	3
PUBP 3315	Environmental Policy and Politics	3

Program of Study - Earth System Physics

The EAS minor with an Earth System Physics track is for students in majors outside of EAS interested in applying physical and mathematical principles to environmental problems. Prerequisites required for some of the classes listed below. **This minor must comprise at least 15 semester hours, of which at least 9 semester hours are upper-division coursework (numbered 3000 or above).**

Code	Title	Credit Hours
Required Courses		
EAS 3610	Introduction to Geophysics	3
EAS 4655	Atmospheric Dynamics	3
Electives		
Select three of the following:		9
EAS 2750	Physics of the Weather	
EAS 3603	Thermodynamics of Earth Systems	
EAS 4312	Geodynamics	

	EAS 4331	Physical Volcanology
	EAS 4360	Space Physics and Space Instrumentation
	EAS 4370	Physics of Planets
	EAS 4410	Climate and Global Change
	EAS 4450	Synoptic Meteorology
	EAS 4470	Large-scale Atmospheric Circulations
	EAS 4699	Undergraduate Research [1]
Total Credit Hours		**15**

[1] A maximum of 3 credit hours of EAS 4699 may be included in the EAS minor program.

Program of Study - Environmental Chemistry

The EAS minor with an Environmental Chemistry track is for students in majors outside of EAS that seek to understand and address environmental problems within the context of chemical systems. Prerequisites required for some of the classes listed below. **This minor must comprise at least 15 credit hours, of which at least 9 credit hours are upper-division coursework (numbered 3000 or above).**

Code	Title	Credit Hours
Required Courses		
EAS 3620	Geochemistry	4
EAS 4740	Atmospheric Chemistry Laboratory	3
Electives		
Select 8 credit hours from the following:		8
EAS 3110	Energy, Environment, and Society	
EAS 4420	Environmental Field Methods	
EAS 4602	Biogeochemical Cycles	
EAS 4610	Earth System Modeling	
EAS 4699	Undergraduate Research [1]	
EAS 4795	Groundwater Hydrology	
Total Credit Hours		**15**

[1] A maximum of 3 credit hours of EAS 4699 may be included in the EAS minor program.

Program of Study - Environmental Science

The EAS minor with an Environmental Science track is for students in majors outside of EAS who have an interest in understanding the Environment and Issues surrounding it. Prerequisites required for some of the classes listed below. **This minor must comprise at least 15 credit hours, of which at least 9 credit hours are upper-division coursework (numbered 3000 or above).**

Code	Title	Credit Hours
Required Course		
EAS 1600	Introduction to Environmental Science	4
or EAS 1601	Habitable Planet	
Electives		
Select 11 credit hours from the following:		11
EAS 2600	Earth Processes	
EAS 2750	Physics of the Weather	
EAS 3110	Energy, Environment, and Society	
EAS 3620	Geochemistry	
EAS 4410	Climate and Global Change	
EAS 4420	Environmental Field Methods	
EAS 4300	Introduction to Physical and Chemical Oceanography	
EAS 4350	Paleoclimatology and Paleoceanography	
EAS 4699	Undergraduate Research [1]	
EAS 4740	Atmospheric Chemistry Laboratory	
Total Credit Hours		**15**

[1] A maximum of 3 credit hours of EAS 4699 may be included in the EAS minor program.

Program of Study - Geophysics

The EAS minor with a Geophysics track is for students in majors outside of EAS majoring in science and engineering. Prerequisites required for some of the classes listed below. **This minor must comprise at least 15 credit hours, of which at least 9 credit hours are upper-division coursework (numbered 3000 or above).**

Code	Title	Credit Hours
Required Courses		
EAS 2600	Earth Processes	4
EAS 3610	Introduction to Geophysics	3
Electives		
Select 8 credit hours from the following:		8
EAS 4312	Geodynamics	
EAS 4314	Seismology	
EAS 4331	Physical Volcanology	
EAS 4360	Space Physics and Space Instrumentation	
EAS 4370	Physics of Planets	
EAS 4699	Undergraduate Research [1]	
EAS 4795	Groundwater Hydrology	
Total Credit Hours		**15**

[1] A maximum of 3 credit hours of EAS 4699 may be included in the EAS minor program.

Program of Study - Meteorology

The EAS minor with a Meteorology track is for students in majors outside of EAS majoring in science and engineering. Prerequisites required for some of the classes listed below. **This minor must comprise at least 15 credit hours, of which at least 9 credit hours are upper-division coursework (numbered 3000 or above).**

Code	Title	Credit Hours
Required Courses		
EAS 2551	Introduction to Meteorological Analysis	1
EAS 2750	Physics of the Weather	3
EAS 4655	Atmospheric Dynamics	3
Electives		

Select 8 credit hours from the following:		8
EAS 3603	Thermodynamics of Earth Systems	
EAS 4410	Climate and Global Change	
EAS 4450	Synoptic Meteorology	
EAS 4460	Satellite and Radar Meteorology	
EAS 4470	Large-scale Atmospheric Circulations	
EAS 4480	Environmental Data Analysis	
EAS 4610	Earth System Modeling	
EAS 4656	Atmospheric Dynamics Practicum	
EAS 4670	Atmospheric Dynamics II	
EAS 4699	Undergraduate Research [1]	
Total Credit Hours		**15**

[1] A maximum of 3 credit hours of EAS 4699 may be included in the EAS minor program.

Program of Study - Ocean Sciences

The EAS minor with an Ocean Sciences track is for students in majors outside of EAS majoring in Biology, Civil and Environmental Engineering, Chemistry and Biochemistry, and Chemical and Biomolecular Engineering. Prerequisites required for some of the classes listed below. **This minor must comprise at least 15 credit hours, of which at least 9 credit hours are upper-division coursework (numbered 3000 or above).**

Code	Title	Credit Hours
Required Courses		
EAS 4300	Introduction to Physical and Chemical Oceanography	3
Select one of the following:		4
EAS 1600	Introduction to Environmental Science	
EAS 1601	Habitable Planet	
EAS 2600	Earth Processes	
Electives		
Select 8 credit hours from the following:		8
EAS 3620	Geochemistry	
EAS 4350	Paleoclimatology and Paleoceanography	
EAS 4410	Climate and Global Change	
EAS 4420	Environmental Field Methods	
EAS 4480	Environmental Data Analysis	
EAS 4610	Earth System Modeling	
EAS 4655	Atmospheric Dynamics	
EAS 4699	Undergraduate Research [1]	
BIOL 4221	Biological Oceanography	
BIOL 4417	Marine Ecology	
Total Credit Hours		**15**

[1] A maximum of 3 credit hours of EAS 4699 may be included in the EAS minor program.

1. All courses counting toward the minor must be taken on a letter-grade basis and must be completed with a grade of C (2.00) or better.
2. A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
3. It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in East Asian Studies

The Minor in East Asian Studies is comprised of courses in history, political science, economics, languages, media, cinema, and literature. The interdisciplinary Ivan Allen College East Asian Studies minor connects study of China, Japan, and Korea and of Southeast Asia. East Asia plays a significant role in world politics and the global economy, and study of the region should be an integral part of a contemporary education. Through interdisciplinary study of history, politics, economics, literature, media, and languages in the regions of East Asia, and to a lesser extent Southeast Asia, students engage in comparative study of societies and values. This minor (jointly administered by Modern Languages and Literature, Media, and Communication) is designed for undergraduates who will enter a wide range of careers (engineering, science, business, public service, law, teaching, research, etc.).

Minor Program of Study & Guidelines

Program of Study

Code	Title	Credit Hours
Required Courses		
Select 12 credit hours from the approved list.		12
Select at least one CHIN/JAPN/KOR course from the approved list.		3
Total Credit Hours		**15**

Approved Courses

Code	Title	Credit Hours
HTS 2061	Traditional Asia and Its Legacy	3
HTS 2062	Asia in the Modern World	3
HTS 3061	Modern China	3
HTS 3062	Modern Japan	3
HTS 4061	Seminar in Asian History	4
INTA 2100	Theoretical Approaches to Great Power Relations	3
INTA 2230	Government and Politics of Asia	3
INTA 3101	International Institutions (Asia) [1]	3
INTA 3130	Foreign Policy of China	3
INTA 3131	Pacific Security Issues [1]	3
INTA 3230	Government and Politics of China	3
INTA 3231	Government and Politics of Japan	3
INTA 3330	Political Economy of China	3
INTA 3331	Political Economy of Japan	3

INTA 4050	International Affairs and Technology Policy Making (Asia) [1]	3
INTA 4101	Politics of the Vietnam War	3
INTA 4330	Chinese Economic Reform (co-taught)	3
INTA 4332	Chinese Institutions and Policy Process (co-taught)	3
INTA 4333	Korean Security Policy	3
INTA 4743	Japanese Society and Politics	3
INTA 4500	Pro-Seminar in International Affairs	3
LMC 3256	Major Filmmakers [2]	3
LMC 3257	Global Cinema [2]	3
CHIN 3004	Advanced Chinese I	3
CHIN 3021	Chinese Society and Culture I	3
CHIN 3022	Chinese Society and Culture II	3
CHIN 3691	Chinese for Current Events	3
CHIN 3692	Business Chinese	3
CHIN 3696	Economic Development and Sustainability in China	3
CHIN 4003	Advanced Chinese II: Contemporary China	3
CHIN 4004	Advanced Chinese III: Contemporary China	3
CHIN 4021	Advanced Language, Popular Music and Culture	3
CHIN 4022	Kungfu Fiction/Pop Cul	3
CHIN 4031	Chinese-Language Cinema: Technological, Cultural, and Urban Transformation in China	3
CHIN 4500	Advanced Intercultural Seminar	3
JAPN 3691	Technical and Scientific Japanese	3
JAPN 3692	Business Japanese	3
JAPN 3693	Japan Today	3
JAPN 4113	Advanced reading and Listening in Japanese	3
JAPN 4123	Technical and Business Japanese Translation	3
JAPN 4163	Introduction to Japanese Literature and Culture	3
JAPN 4165	Critical Readings in Japanese Culture and Arts	3
JAPN 4173	Japanese Culture and Society through Anime	3
JAPN 4183	Japanese Culture and Society through Songs	3
JAPN 4500	Advanced Intercultural Seminar	3
JAPN 4743	Japanese Society and Politics	3
JAPN 4750	Japanese Discourse and Grammar	3
KOR 3693	Exploring Modern Korea	3
KOR 4001	Contemporary Korean	3
KOR 4002	Selected Readings Of Modern Korean	3

1 Only Asia-focused versions of INTA 3101, INTA 3131, and INTA 4050 (i.e. sections taught in the INTA Southeast Asia Study Abroad Program) will count towards the East Asian Studies minor.

2 Only these versions of LMC 3256 and LMC 3257 (East Asian Auteurs and Chinese Martial Arts Cinema) can be presented for minor credit.

- The multidisciplinary East Asian Studies minor must consist of 15 credit hours of which at least 9 credit hours are upper-division coursework (numbered 3000 or above) from the approved list on the following page.
- Courses must be taken from at least two schools in the Ivan Allen College. At least one course presented for the minor must be a Chinese, Japanese, or Korean course offered by the School of Modern Languages from the list provided below or approved by a co-coordinator. With the approval of a co-coordinator, a student may count one course taken outside Ivan Allen College of Liberal Arts toward the minor; if approved by a co-coordinator, this course may be taken at another university.
- A multidisciplinary or other minor may contain courses in a student's major field of study. A maximum of 6 credit hours of such courses may be used to satisfy the course requirements for the minor, provided these courses are not also used to satisfy any course requirement in the student's major degree program.
- A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 redit hours of Special Topics and 3 credit hours of either Special Problems or Undergraduate Research. Students may not use 6 credit hours of either Special Problems or Undergraduate Research for a minor.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- All courses counting toward the minor must be taken on a letter-grade basis and must be completed with a grade of C (2.00) or better.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in Economics

The economics minor provides exposure to the fundamental economic way of thinking and approaching a multitude of complex problems. The field of economics is highly interdisciplinary, making our minor program an excellent critical and analytical supplement to a variety of existing majors. The courses included in the minor allow students to diversify their analytical skill sets with practice in computation and data analysis, fundamental economic theory, and empirical methods. The economics minor provides excellent concrete data science skills directly applicable for pursuing careers in multiple sectors.

Minor Program of Study & Guidelines

Program of Study

Code	Title	Credit Hours
Select 15 credit hours of Economics courses [1]		15
Total Credit Hours		**15**

1 Nine credit hours must be upper-division coursework (numbered 3000 or above).

- A maximum of 4 credit hours of Special Topics may be included in the Economics minor. Special Problems may not be included in the Economics minor.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor.This includes courses taken at

another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.

- All courses counting toward the minor must be taken on a letter-grade basis and must be completed with a grade of C (2.00) or better.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in Energy Systems

The Energy Systems Minor provides students a 15-hour multidisciplinary educational opportunity to study energy systems. The minor includes courses which provide depth in an area relevant to energy that is within the scope of the student's chosen program. Depth course options available to students may vary depending on the program. Appropriate courses are selected by program faculty to meet the needs of their students. The minor also includes requirements for courses which cut across disciplines. These courses are intended to add breadth of knowledge in areas outside the student's major but important to energy systems. A terminal "capstone" or project course provides an opportunity for students from multiple disciplines to work together in multidisciplinary teams on a significant project in the energy area. Appropriate projects are either solicited from industry or faculty experts.

The minor is open to all Georgia Tech undergraduate students whose majors have approved the minor. The breadth courses and the capstone project course, courses taken by all students completing the minor, require one or more pre-requisites; specifically, basic economics, mathematics, and lab science courses.

Minor Program of Study & Guidelines

The minor includes requirements for courses which cut across disciplines. These courses are intended to add breadth of knowledge in areas outside the student's major but important to energy systems. A terminal "capstone" or project course provides an opportunity for students from multiple disciplines to work together in multidisciplinary teams on a significant project in the energy area.

The breadth courses and the capstone project course, courses taken by all students completing the minor, require one or more prerequisites; specifically, basic economics, mathematics, and lab science courses. The minor must consist of at least 15 credit hours and all courses in the minor also must be 3000 level and above.

A multidisciplinary or other minor may contain courses in a student's major field of study. A maximum of 6 credit hours of such courses may be used to satisfy the course requirements for the minor, provided these courses are not also used to satisfy any course requirement in the student's major degree program.

All courses counting toward the minor must be taken on a letter-grade basis and completed with an overall grade-point average of at least 2.00.

All courses in the minor also must be 3000 level and above.

Program of Study - Track for Aerospace Engineering Students

Prerequisite Courses

Students ordinarily pursue the minor upon completion of the needed prerequisites. However, the
depth course requirements may be taken as soon as students have met the relevant prerequisites.

The prerequisites needed for one or more of the courses required for the minor (breadth courses and the capstone project course) are (all existing courses):

Code	Title	Credit Hours
Mathematics		
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
or MATH 1554	Linear Algebra	
MATH 1552	Integral Calculus	4
MATH 2551	Multivariable Calculus	4
Physics		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
Chemistry		
CHEM 1310	General Chemistry	4
or CHEM 1211	Chemical Principles I	
Economics		
Select one of the following:		3-6
ECON 2100	Economic Analysis and Policy Problems	
or ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
& ECON 2106	and Principles of Microeconomics	

Requirements

Code	Title	Credit Hours
Depth Courses		
Select 6 credit hours related to energy systems: [1]		6
AE 4701	Wind Engineering	
AE 4370	Life Cycle Cost Analysis	
NRE 3208	Nuclear Reactor Phys I	
NRE 3301	Radiation Physics	
AE 4461	Introduction to Combustion	
Breadth Courses		
Select two of the following: [2]		6
ECON 3300	Economics of International Energy Markets	
PUBP 3350	Energy Policy	
CHEM 3700	The Science of Alternative Energy	
Capstone Course		
GT 4813	Project in Energy Systems [3]	3
Total Credit Hours		**15**

[1]
- The Depth Courses may have additional prerequisites; please check the current prerequisites.
- A list of acceptable courses which meet the depth requirement is provided by each major approving the minor. Depth courses may be taken in the student's major to ensure the depth in that major needed to peruse a multidisciplinary minor. All acceptable depth courses must be consistent with the goals of the minor. Examples of acceptable courses include engineering courses covering a specific energy technology like solar or relevant engineering science.

[2]
- Students should strive to complete the necessary prerequisites and the depth courses prior to enrolling in the breadth courses. However, depth courses may be taken concurrently with the courses taken to meet the breadth requirement.
- Breadth courses may ordinarily serve as technical or free electives in the student's program of study. However, courses required by name and number and/or used to satisfy Core Areas A through E cannot be used to satisfy the requirements of a minor.

[3] Ordinarily, students must complete all minor requirements before they can register for the Project in Energy Systems course.

Program of Study - Track for Chemical and Biomolecular Engineering Students

Prerequisite Courses

Students ordinarily pursue the minor upon completion of the needed prerequisites. However, the depth course requirements may be taken as soon as students have met the relevant prerequisites.

The prerequisites needed for one or more of the courses required for the minor (breadth courses and the capstone project course) are (all existing courses):

Code	Title	Credit Hours
Mathematics		
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
or MATH 1554	Linear Algebra	
MATH 1552	Integral Calculus	4
MATH 2551	Multivariable Calculus	4
Physics		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
Chemistry		
CHEM 1310	General Chemistry	4
or CHEM 1211	Chemical Principles I	
Economics		
Select one of the following:		3-6
ECON 2100	Economic Analysis and Policy Problems	
or ECON 2101	The Global Economy	
ECON 2105 & ECON 2106	Principles of Macroeconomics and Principles of Microeconomics	

Requirements

Code	Title	Credit Hours
Depth Courses		
Select 6 credit hours related to energy systems: [1]		6
CHBE 4020	Chemical Engineering in Nanoscale Systems	
CHBE 4310	Bioprocess Engineering	
CHBE 4760	Biocatalysis and Metabolic Engineering	
CHBE 4803	Special Topics (Electrochemical Energy Storage & Conversion)	
CHBE 6130	Electrochemical Engineering	
Breadth Courses		
Select two of the following: [2]		6
ECON 3300	Economics of International Energy Markets	
PUBP 3350	Energy Policy	
CHEM 3700	The Science of Alternative Energy	
Capstone Course		
GT 4813	Project in Energy Systems [3]	3
Total Credit Hours		**15**

[1]
- The Depth Courses may have additional prerequisites; please check the current prerequisites.
- A list of acceptable courses which meet the depth requirement is provided by each major approving the minor. Depth courses may be taken in the student's major to ensure the depth in that major needed to peruse a multidisciplinary minor. All acceptable depth courses must be consistent with the goals of the minor. Examples of acceptable courses include engineering courses covering a specific energy technology like solar or relevant engineering science.

[2] Students should strive to complete the necessary prerequisites and the depth courses prior to enrolling in the breadth courses. However, depth courses may be taken concurrently with the courses taken to meet the breadth requirement.

[3] Ordinarily, students must complete all minor requirements before they can register for the Project in Energy Systems course.

Program of Study - Track for Civil and Environmental Engineering Students

Prerequisite Courses

Students ordinarily pursue the minor upon completion of the needed prerequisites. However, the depth course requirements may be taken as soon as students have met the relevant prerequisites.

The prerequisites needed for one or more of the courses required for the minor (breadth courses and the capstone project course) are (all existing courses):

Code	Title	Credit Hours
Mathematics		
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
or MATH 1554	Linear Algebra	
MATH 1552	Integral Calculus	4
MATH 2551	Multivariable Calculus	4
Physics		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
Chemistry		
CHEM 1310	General Chemistry	4

	or CHEM 1211	Chemical Principles I
Economics		
Select one of the following:		3-6
	ECON 2100	Economic Analysis and Policy Problems
	or ECON 2101	The Global Economy
	ECON 2105 & ECON 2110	Principles of Macroeconomics and Principles of Microeconomics

Requirements

Code	Title	Credit Hours
Depth Courses		
Select 6 credit hours related to energy systems: [1]		6
AE 4370	Life Cycle Cost Analysis	3
CEE 4330	Air Pollution Engineering	3
CEE 4450	Introduction to Petroleum Geomechanics	3
CEE 4803	Marine and Hydrokinetic Renewable Energy	
EAS 3110	Energy, Environment, and Society	3
EAS 4410	Climate and Global Change	3
Breadth Courses		
Select two of the following: [2]		6
ECON 3300	Economics of International Energy Markets	
PUBP 3350	Energy Policy	
CHEM 3700	The Science of Alternative Energy	
Capstone Course		
GT 4813	Project in Energy Systems [3]	3
Total Credit Hours		**30**

1
- The Depth Courses may have additional prerequisites; please check the current prerequisites.
- A list of acceptable courses which meet the depth requirement is provided by each major approving the minor. Depth courses may be taken in the student's major to ensure the depth in that major needed to peruse a multidisciplinary minor. All acceptable depth courses must be consistent with the goals of the minor. Examples of acceptable courses include engineering courses covering a specific energy technology like solar or relevant engineering science.

2
- Students should strive to complete the necessary prerequisites and the depth courses prior to enrolling in the breadth courses. However, depth courses may be taken concurrently with the courses taken to meet the breadth requirement.
- Breadth courses may ordinarily serve as technical or free electives in the student's program of study. However, courses required by name and number and/or used to satisfy Core Areas A through E cannot be used to satisfy the requirements of a minor.

3 Ordinarily, students must complete all minor requirements before they can register for the Project in Energy Systems course.

Program of Study - Track for Electrical and Computer Engineering Students

Prerequisite Courses

Students ordinarily pursue the minor upon completion of the needed prerequisites. However, the depth course requirements may be taken as soon as students have met the relevant prerequisites.

The prerequisites needed for one or more of the courses required for the minor (breadth courses and the capstone project course) are (all existing courses):

Code	Title	Credit Hours
Mathematics		
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
or MATH 1554	Linear Algebra	
MATH 1552	Integral Calculus	4
MATH 2551	Multivariable Calculus	4
Physics		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
Chemistry		
CHEM 1310	General Chemistry	4
or CHEM 1211	Chemical Principles I	
Economics		
Select one of the following:		3-6
ECON 2100	Economic Analysis and Policy Problems	
or ECON 2101	The Global Economy	
ECON 2105 & ECON 2110	Principles of Macroeconomics and Principles of Microeconomics	

Requirements

Code	Title	Credit Hours
Depth Courses		
Select 6 credit hours of depth courses related to energy systems: [1]		6
ECE 3070	Electromechanical and Electromagnetic Energy Conversion [2]	
ECE 3071	Modern Electric Energy Systems [2]	
ECE 4320	Power System Analysis and Control	
ECE 4321	Power System Engineering	
ECE 4325	Electric Power Quality	
ECE 4330	Power Electronics	
ECE 4335	Electric Machinery Analysis	
NRE 3208	Nuclear Reactor Phys I	
NRE 3301	Radiation Physics	
Breadth Courses		
Select two of the following: [3]		6
ECON 3300	Economics of International Energy Markets	
PUBP 3350	Energy Policy	
CHEM 3700	The Science of Alternative Energy	
Capstone Course		
GT 4813	Project in Energy Systems [4]	3
Total Credit Hours		**15**

[1]
- The Depth Courses may have additional prerequisites; please check the current prerequisites.
- A list of acceptable courses which meet the depth requirement is provided by each major approving the minor. Depth courses may be taken in the student's major to ensure the depth in that major needed to peruse a multidisciplinary minor. All acceptable depth courses must be consistent with the goals of the minor. Examples of acceptable courses include engineering courses covering a specific energy technology like solar or relevant engineering science.
- Any course on this list that is taken for ECE elective, engineering elective, or approved elective credit can count for this minor.

[2] If used for EE Breadth credit, ECE 3070 and ECE 3071 cannot be used for this minor.

[3]
- Students should strive to complete the necessary prerequisites and the depth courses prior to enrolling in the breadth courses. However, depth courses may be taken concurrently with the courses taken to meet the breadth requirement.
- Breadth courses may ordinarily serve as technical or free electives in the student's program of study. However, courses required by name and number and/or used to satisfy Core Areas A through E cannot be used to satisfy the requirements of a minor.

[4] Ordinarily, students must complete all minor requirements before they can register for the Project in Energy Systems course.

Program of Study - Track for Industrial and Systems Engineering Students

Prerequisite Courses

Students ordinarily pursue the minor upon completion of the needed prerequisites. However, the depth course requirements may be taken as soon as students have met the relevant prerequisites.

The prerequisites needed for one or more of the courses required for the minor (breadth courses and the capstone project course) are (all existing courses):

Code	Title	Credit Hours
Mathematics		
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
or MATH 1554	Linear Algebra	
MATH 1552	Integral Calculus	4
MATH 2551	Multivariable Calculus	4
Physics		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
Chemistry		
CHEM 1310	General Chemistry	4
or CHEM 1211	Chemical Principles I	
Economics		
Select one of the following:		3-6
ECON 2100	Economic Analysis and Policy Problems	
or ECON 2101	The Global Economy	
ECON 2105 & ECON 2106	Principles of Macroeconomics and Principles of Microeconomics	

Requirements

Code	Title	Credit Hours
Depth Courses		
Select 6 credit hours of depth courses related to energy systems: [1]		6
AE/ME 4701	Wind Engineering	
ECE 3072	Electrical Energy Systems	
ISYE 4803	Special Topics (Energy and Environment)	
ME 4011	Internal Combustion Engines	
ME 4325	Introduction to Fuel Cell Systems	
ME 4823	Special Topics (Mechatronic sys in Hybrid-electric power trains)	
ME 4171	Environmentally Conscious Design and Manufacturing	
ME 4172	Designing Sustainable Engineering Systems	
ME 4803	Special Topics in Mechanical Engineering (Thermal Systems Engineering)	
NRE 4610	Introduction to Plasma Physics and Fusion Engineering	
Breadth Courses		
Select two of the following: [2]		6
CHEM 3700	The Science of Alternative Energy	
EAS 4410	Climate and Global Change	
EAS 3110	Energy, Environment, and Society	
ECON 3300	Economics of International Energy Markets	
PUBP 3315	Environmental Policy and Politics	
PUBP 3350	Energy Policy	
PUBP 3600	Sustainability, Technology, and Policy	
PUBP 4440	Science, Technology, and Regulation	
PHIL 4176	Environmental Ethics	
Capstone Course		
GT 4813	Project in Energy Systems [3]	3
Total Credit Hours		**15**

[1]
- The Depth Courses may have additional prerequisites; please check the current prerequisites.
- A list of acceptable courses which meet the depth requirement is provided by each major approving the minor. Depth courses may be taken in the student's major to ensure the depth in that major needed to peruse a multidisciplinary minor. All acceptable depth courses must be consistent with the goals of the minor. Examples of acceptable courses include engineering courses covering a specific energy technology like solar or relevant engineering science.

[2] Students should strive to complete the necessary prerequisites and the depth courses prior to enrolling in the breadth courses. However, depth courses may be taken concurrently with the courses taken to meet the breadth requirement.

[3] Ordinarily, students must complete all minor requirements before they can register for the Project in Energy Systems course.

Program of Study - Track for Mechanical Engineering Students

Prerequisite Courses

Students ordinarily pursue the minor upon completion of the needed prerequisites. However, the depth course requirements may be taken as soon as students have met the relevant prerequisites.

The prerequisites needed for one or more of the courses required for the minor (breadth courses and the capstone project course) are (all existing courses):

Code	Title	Credit Hours
Mathematics		
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
or MATH 1554	Linear Algebra	
MATH 1552	Integral Calculus	4
MATH 2551	Multivariable Calculus	4
Physics		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
Chemistry		
CHEM 1310	General Chemistry	4
or CHEM 1211	Chemical Principles I	
Economics		
Select one of the following:		3-6
ECON 2100	Economic Analysis and Policy Problems	
or ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
& ECON 2106	and Principles of Microeconomics	

Requirements

Code	Title	Credit Hours
Depth Courses		
Select 6 credit hours related to energy systems: [1]		6
ME 4011	Internal Combustion Engines	
ME 4315	Energy Systems Analysis and Design	
ME 4325	Introduction to Fuel Cell Systems	
ME 4321	Refrigeration and Air Conditioning	
ME 4823	Special Topics (Mechatronic Systems in Hybrid-Electric Powertrains)	
ME 4823	Special Topics (Renewable Energy Systems)	
ME 4171	Environmentally Conscious Design and Manufacturing	
ME 4172	Designing Sustainable Engineering Systems	
ME 4701	Wind Engineering	
ECE 3071	Modern Electric Energy Systems	
NRE 3208	Nuclear Reactor Phys I	
NRE 4214	Reactor Engineering	
NRE 4610	Introduction to Plasma Physics and Fusion Engineering	
CHEM 3700	The Science of Alternative Energy	
ECON 3300	Economics of International Energy Markets	
PUBP 3350	Energy Policy	
Breadth Courses [2]		6
Capstone Course		
GT 4813	Project in Energy Systems [3]	3
Total Credit Hours		**15**

1 The Depth Courses may have additional prerequisites; please check the current prerequisites.

- A list of acceptable courses which meet the depth requirement is provided by each major approving the minor. Depth courses may be taken in the student's major to ensure the depth in that major needed to peruse a multidisciplinary minor. All acceptable depth courses must be consistent with the goals of the minor. Examples of acceptable courses include engineering courses covering a specific energy technology like solar or relevant engineering science.

2
- Students should strive to complete the necessary prerequisites and the depth courses prior to enrolling in the breadth courses. However, depth courses may be taken concurrently with the courses taken to meet the breadth requirement.
- Breadth courses may ordinarily serve as technical or free electives in the student's program of study. However, courses required by name and number and/or used to satisfy Core Areas A through E cannot be used to satisfy the requirements of a minor. All courses in the minor also must be 3000 level and above.

3 Ordinarily, students must complete all minor requirements before they can register for the Project in Energy Systems course.

Program of Study - Track for Economics (including EIA, and GEML) Students

Prerequisite Courses

Students ordinarily pursue the minor upon completion of the needed prerequisites. However, the depth course requirements may be taken as soon as students have met the relevant prerequisites.

The prerequisites needed for one or more of the courses required for the minor (breadth courses and the capstone project course) are (all existing courses):

Code	Title	Credit Hours
Mathematics		
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
or MATH 1554	Linear Algebra	
MATH 1552	Integral Calculus	4
MATH 2551	Multivariable Calculus	4
Physics		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
Chemistry		
CHEM 1310	General Chemistry	4
or CHEM 1211	Chemical Principles I	
Economics		
Select one of the following:		3-6
ECON 2100	Economic Analysis and Policy Problems	
or ECON 2101	The Global Economy	

ECON 2105 & ECON 2106	Principles of Macroeconomics and Principles of Microeconomics	

Requirements

Code	Title	Credit Hours
Depth Courses [1]		
ECON 4440	Economics of Natural Resources and the Environment	3
ECON 4340	Economics of Industrial Competition	3
Breadth Courses		
Select 6 credit hours from the following: [2]		6
ME 3700	Introduction to Energy Systems Engineering	
PUBP 3350	Energy Policy	
CHEM 3700	The Science of Alternative Energy	
Capstone Course		
GT 4813	Project in Energy Systems [3]	3
Total Credit Hours		**15**

1
- The Depth Courses may have additional prerequisites; please check the current prerequisites.
- A list of acceptable courses which meet the depth requirement is provided by each major approving the minor. Depth courses may be taken in the student's major to ensure the depth in that major needed to peruse a multidisciplinary minor. All acceptable depth courses must be consistent with the goals of the minor. Examples of acceptable courses include economics courses covering economic analysis of complex systems.

2 Students should strive to complete the necessary prerequisites and the depth courses prior to enrolling in the breadth courses. However, depth courses may be taken concurrently with the courses taken to meet the breadth requirement.

3 Ordinarily, students must complete all minor requirements before they can register for the Project in Energy Systems course.

Program of Study - Track for Public Policy Students

Prerequisite Courses

Students ordinarily pursue the minor upon completion of the needed prerequisites. However, the depth course requirements may be taken as soon as students have met the relevant prerequisites.

The prerequisites needed for one or more of the courses required for the minor (breadth courses and the capstone project course) are (all existing courses):

Code	Title	Credit Hours
Mathematics		
MATH 1551	Differential Calculus	2
MATH 1553 or MATH 1554	Introduction to Linear Algebra Linear Algebra	2
MATH 1552	Integral Calculus	4
MATH 2551	Multivariable Calculus	4
Physics		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
Chemistry		
CHEM 1310 or CHEM 1211	General Chemistry Chemical Principles I	4
Economics		
Select one of the following:		3-6
ECON 2100 or ECON 2101	Economic Analysis and Policy Problems The Global Economy	
ECON 2105 & ECON 2106	Principles of Macroeconomics and Principles of Microeconomics	

Requirements

Code	Title	Credit Hours
Depth Courses		
Select 6 credit hours of depth courses related to energy systems: [1]		6
PUBP 3315	Environmental Policy and Politics	
PUBP 3600	Sustainability, Technology, and Policy	
PHIL 4176	Environmental Ethics	
PUBP 4440	Science, Technology, and Regulation	
Breadth Courses		
Select 6 credit hours from the following: [2]		6
ME 3700	Introduction to Energy Systems Engineering	
ECON 3300	Economics of International Energy Markets	
CHEM 3700	The Science of Alternative Energy	
Capstone Course		
GT 4813	Project in Energy Systems [3]	3
Total Credit Hours		**15**

1 The Depth Courses may have additional prerequisites; please check the current prerequisites.
- A list of acceptable courses which meet the depth requirement is provided by each major approving the minor. Depth courses may be taken in the student's major to ensure the depth in that major needed to peruse a multidisciplinary minor. All acceptable depth courses must be consistent with the goals of the minor. Examples of acceptable courses include economics courses covering economic analysis of complex systems.

2
- Students should strive to complete the necessary prerequisites and the depth courses prior to enrolling in the breadth courses. However, depth courses may be taken concurrently with the courses taken to meet the breadth requirement.
- Breadth courses may ordinarily serve as technical or free electives in the student's program of study. However, courses required by name and number and/or used to satisfy Core Areas A through E cannot be used to satisfy the requirements of a minor.

3 Ordinarily, students must complete all minor requirements before they can register for the Project in Energy Systems course.

Program of Study - Track for Biology Students

Prerequisite Courses

Students ordinarily pursue the minor upon completion of the needed prerequisites. However, the depth course requirements may be taken as soon as students have met the relevant prerequisites.

The prerequisites needed for one or more of the courses required for the minor (breadth courses and the capstone project course) are (all existing courses):

Code	Title	Credit Hours
Mathematics		
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
or MATH 1554	Linear Algebra	
MATH 1552	Integral Calculus	4
MATH 2551	Multivariable Calculus	4
Physics		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
Chemistry		
CHEM 1310	General Chemistry	4
or CHEM 1211	Chemical Principles I	
Economics		
Select one of the following:		3-6
ECON 2100	Economic Analysis and Policy Problems	
or ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
& ECON 2106	and Principles of Microeconomics	

Requirements

Code	Title	Credit Hours
Depth Courses		
Select 6 credit hours of depth courses related to energy systems: [1]		6
BIOL 4221	Biological Oceanography	
BIOL 4410	Microbial Ecology	
BIOL 4418	Microbial Physiology	
BIOL 4440	Plant Physiology	
CHEM 3511	Survey of Biochemistry	
CHEM 4511	Biochemistry I	
CHEM 4512	Biochemistry II	
EAS 4410	Climate and Global Change	
EAS 3110	Energy, Environment, and Society	
Breadth Courses		
Select 6 credit hours from the following: [2]		6
ME 3700	Introduction to Energy Systems Engineering	
ECON 3300	Economics of International Energy Markets	
PUBP 3350	Energy Policy	
Capstone Course		
GT 4813	Project in Energy Systems [3]	3
Total Credit Hours		**15**

1
- The Depth Courses may have additional prerequisites; please check the current prerequisites.
- A list of acceptable courses which meet the depth requirement is provided by each major approving the minor. Depth courses may be taken in the student's major to ensure the depth in that major needed to peruse a multidisciplinary minor. All acceptable depth courses must be consistent with the goals of the minor. Examples of acceptable courses include science courses which cover energy science like biomass or other relevant basic science.

2 Students should strive to complete the necessary prerequisites and the depth courses prior to enrolling in the breadth courses. However, depth courses may be taken concurrently with the courses taken to meet the breadth requirement.

3 Ordinarily, students must complete all minor requirements before they can register for the Project in Energy Systems course.

Program of Study - Track for Chemistry and Biochemistry Students

1. Courses at the 1000 level may NOT be used toward the minor.
2. A maximum of 3 credit hours of Special Topics (in biochemistry) courses may be included in the minimum 15 credit hours of a minor program.
3. A maximum of 3 credit hours of CHEM 4699 may be used toward the minor.
4. All courses counting toward the minor must be completed with an overall average GPA of at least 2.0.
5. All courses counting toward the minor must be completed with on a letter grade basis.
6. A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
7. It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Prerequisite Courses

Students ordinarily pursue the minor upon completion of the needed prerequisites. However, the depth course requirements may be taken as soon as students have met the relevant prerequisites.

The prerequisites needed for one or more of the courses required for the minor (breadth courses and the capstone project course) are (all existing courses):

Code	Title	Credit Hours
Mathematics		
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
or MATH 1554	Linear Algebra	
MATH 1552	Integral Calculus	4
MATH 2551	Multivariable Calculus	4
Physics		

PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
Chemistry		
CHEM 1310	General Chemistry	4
or CHEM 12	Chemical Principles I	
Economics		
Select one of the following:		3-6
ECON 2100	Economic Analysis and Policy Problems	
or ECON 21	The Global Economy	
ECON 2105	Principles of Macroeconomics	
& ECON 21	and Principles of Microeconomics	

Requirements

Code	Title	Credit Hours
Depth Courses		
Select 6 credit hours of depth courses related to energy systems: [1]		6
CHEM 3511	Survey of Biochemistry	
CHEM 4113	Applications of Inorganic Chemistry in Current Energy Research	
CHEM 4XXX	Chemistry Elective	
or CHEM 42	Environmental Analytical Chemistry	
CHEM 4XXX	Chemistry Elective	
or CHEM	Chemistry of Electronic Organic Materials	
Breadth Courses		
Select 6 credit hours from the following: [2]		6
ME 3700	Introduction to Energy Systems Engineering	
ECON 3300	Economics of International Energy Markets	
PUBP 3350	Energy Policy	
Capstone Course		
GT 4813	Project in Energy Systems [3]	3
Total Credit Hours		**15**

1
- The Depth Courses may have additional prerequisites; please check the current prerequisites.
- A list of acceptable courses which meet the depth requirement is provided by each major approving the minor. Depth courses may be taken in the student's major to ensure the depth in that major needed to peruse a multidisciplinary minor. All acceptable depth courses must be consistent with the goals of the minor. Examples of acceptable courses include science courses which cover energy science like biomass or other relevant basic science.

2
- Students should strive to complete the necessary prerequisites and the depth courses prior to enrolling in the breadth courses. However, depth courses may be taken concurrently with the courses taken to meet the breadth requirement.
- Breadth courses may ordinarily serve as technical or free electives in the student's program of study. However, courses required by name and number and/or used to satisfy Core Areas A through E cannot be used to satisfy the requirements of a minor.

3 Ordinarily, students must complete all minor requirements before they can register for the Project in Energy Systems course.

Program of Study - Track for Earth and Atmospheric Sciences Students

Prerequisite Courses

Students ordinarily pursue the minor upon completion of the needed prerequisites. However, the depth course requirements may be taken as soon as students have met the relevant prerequisites.

The prerequisites needed for one or more of the courses required for the minor (breadth courses and the capstone project course) are (all existing courses):

Code	Title	Credit Hours
Mathematics		
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
or MATH 155	Linear Algebra	
MATH 1552	Integral Calculus	4
MATH 2551	Multivariable Calculus	4
Physics		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
Chemistry		
CHEM 1310	General Chemistry	4
or CHEM 12	Chemical Principles I	
Economics		
Select one of the following:		3-6
ECON 2100	Economic Analysis and Policy Problems	
or ECON 21	The Global Economy	
ECON 2105	Principles of Macroeconomics	
& ECON 21	and Principles of Microeconomics	

Requirements

Code	Title	Credit Hours
Depth Courses		
EAS 4410	Climate and Global Change [1]	3
EAS 3110	Energy, Environment, and Society [1]	3
Breadth Courses		
Select 6 credit hours from the following: [2]		6
ME 3700	Introduction to Energy Systems Engineering	
ECON 3300	Economics of International Energy Markets	
PUBP 3350	Energy Policy	
Capstone Course		
GT 4813	Project in Energy Systems [3]	3
Total Credit Hours		**15**

1
- The Depth Courses may have additional prerequisites; please check the current prerequisites.
- A list of acceptable courses which meet the depth requirement is provided by each major approving the minor. Depth courses may be taken in the student's major to ensure the depth in that major needed to peruse a multidisciplinary minor. All acceptable depth courses must be consistent with the goals of the minor. Examples of acceptable courses include science courses which cover energy science like biomass or other relevant basic science.

[2]
- Students should strive to complete the necessary prerequisites and the depth courses prior to enrolling in the breadth courses. However, depth courses may be taken concurrently with the courses taken to meet the breadth requirement.
- Breadth courses may ordinarily serve as technical or free electives in the student's program of study. However, courses required by name and number and/or used to satisfy Core Areas A through E cannot be used to satisfy the requirements of a minor. All courses in the minor also must be 3000 level and above.

[3] Ordinarily, students must complete all minor requirements before they can register for the Project in Energy Systems course.

Program of Study - Track for Physics and Applied Physics Students

Prerequisite Courses

Students ordinarily pursue the minor upon completion of the needed prerequisites. However, the depth course requirements may be taken as soon as students have met the relevant prerequisites.

The prerequisites needed for one or more of the courses required for the minor (breadth courses and the capstone project course) are (all existing courses):

Code	Title	Credit Hours
Mathematics		
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
or MATH 1554	Linear Algebra	
MATH 1552	Integral Calculus	4
MATH 2551	Multivariable Calculus	4
Physics		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
Chemistry		
CHEM 1310	General Chemistry	4
or CHEM 1211	Chemical Principles I	
Economics		
Select one of the following:		3-6
ECON 2100	Economic Analysis and Policy Problems	
or ECON 2101	The Global Economy	
ECON 2105	Principles of Macroeconomics	
& ECON 2106	and Principles of Microeconomics	

Requirements

Code	Title	Credit Hours
Depth Courses		
Select 6 credit hours related to energy systems: [1]		6
PHYS 3141	Thermodynamics	
PHYS 3232	Optics I	
PHYS 4251	Biophysics	
PHYS 4262	Solid-state Physics	
PHYS 4263	Nuclei, Particles, and Fields	
Breadth Courses		
Select two of the following: [2]		6
ECON 3300	Economics of International Energy Markets	
PUBP 3350	Energy Policy	
CHEM 3700	The Science of Alternative Energy	
Capstone Course		
GT 4813	Project in Energy Systems [3]	3
Total Credit Hours		**15**

[1]
- The Depth Courses may have additional prerequisites; please check the current prerequisites.
- A list of acceptable courses which meet the depth requirement is provided by each major approving the minor. Depth courses may be taken in the student's major to ensure the depth in that major needed to peruse a multidisciplinary minor. All acceptable depth courses must be consistent with the goals of the minor. Examples of acceptable courses include engineering courses covering a specific energy technology like solar or relevant engineering science.

[2]
- Students should strive to complete the necessary prerequisites and the depth courses prior to enrolling in the breadth courses. However, depth courses may be taken concurrently with the courses taken to meet the breadth requirement.
- Breadth courses may ordinarily serve as technical or free electives in the student's program of study. However, courses required by name and number and/or used to satisfy Core Areas A through E cannot be used to satisfy the requirements of a minor.

[3] Ordinarily, students must complete all minor requirements before they can register for the Project in Energy Systems course.

Additional Guidelines

- A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or Undergraduate Research.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in Engineering and Business

The Scheller College of Business, the College of Design, the College of Sciences, and the Ivan Allen College of Liberal Arts offer the competitive-admission technology & business minor through the Denning Technology & Management (T&M) Program. It is a course of study that enables undergraduate students from these colleges to learn one another's language through innovative coursework and interdisciplinary team projects focused on solving real-world problems presented by T&M's corporate affiliates.

The minor in technology & business curriculuhttps://www.scheller.gatech.edu/centers-and-initiatives/steven-a-denning-tech-and-management-program/admissions.htmlm requires completing 22

semester credit hours after being accepted to the T&M Program. T&M accepts applications in October.

Admission information is available at: https://www.scheller.gatech.edu/centers-and-initiatives/steven-a-denning-tech-and-management-program/admissions.html

Course requirements are available at: https://www.scheller.gatech.edu/centers-and-initiatives/steven-a-denning-tech-and-management-program/curriculum.html

Program of Study - Track for Business Administration Students

Code	Title	Credit Hours
Required Courses		
COE 3002	Intro to Microelectronics and Nanotechnology Revolution	3
ME 2110	Creative Decisions and Design	3
ME 3141	Cutting-Edge Eng Seminar	3
ME 3743	Analysis of Emerging Technologies	3
ME 3744	Managing Product, Service & Technology Development	3
ME 4741	Integrative Management Development - Project Preparation	3
ME 4742	Integrated Technology and Management Capstone Project	4
Total Credit Hours		**22**

- Students who are admitted to the T&M Program must satisfy the requirements for a bachelor's degree in their major.
- The minimum, cumulative GPA required for applicants to the Denning T&M Program is 3.0 based on a minimum of 12 hours earned at Georgia Tech. In order for accepted students to maintain their eligibility to remain in the T&M Program, they must maintain a minimum 3.0 GPA for the classes required by the Denning T&M curriculum. All courses used to satisfy the requirements of the minor must be taken for a letter grade and must be completed with the grade of C (2.00) or better.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Program of Study - Track for College of Engineering Students

Code	Title	Credit Hours
MGT 3000	Financial and Managerial Accounting	3
MGT 3078	Finance and Investments	3
or MGT 306	Financial Management	
MGT 3300	Marketing Management I	3
MGT 3743	Analysis of Emerging Technologies	3
MGT 3744	Managing Product, Service & Technology Development	3
MGT 4741	Integrative Management Development-Project Preparation	3
MGT 4742	Integrated Technology and Management Capstone Project	4
Total Credit Hours		**22**

- Students who are admitted to the T&M Program must satisfy the requirements for a bachelor's degree in their major.
- The minimum, cumulative GPA required for applicants to the Denning T&M Program is 3.0 based on a minimum of 12 hours earned at Georgia Tech. In order for accepted students to maintain their eligibility to remain in the T&M Program, they must maintain a minimum 3.0 GPA for the classes required by the Denning T&M curriculum. All courses used to satisfy the requirements of the minor must be taken for a letter grade and must be completed with the grade of C (2.00) or better.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in European Studies

Comprised of courses in history, political science, languages, media, and sociology, the interdisciplinary Ivan Allen College European Studies minor connects study of ancient, medieval and modern Europe, including France, Germany, Russia, Spain, the United Kingdom, and the European Union. The countries of Europe individually and collectively a pivotal role in world politics and the global economy. Europe is also key region for U.S. geostrategic and economic interests. Moreover, Europe reflects different ways to structure state-society relations and has contributed greatly to western culture. In addition, the European Union is the world's most advanced form of international cooperation. As a consequence, the study of Europe should be an integral part of a contemporary education. Through interdisciplinary study of culture, history, politics, sociology, and languages in Europe, students engage in comparative study of societies and values. This minor is designed for undergraduates who will enter a wide range of careers (engineering, science, business, public service, law, teaching, research, etc.).

Code	Title	Credit Hours
Required course:		**3**
INTA 2220	Government and Politics of Western Europe	
INTA 2221	Politics of the European Union	
INTA 4230	Seminar in Europe: European Union	
Elective courses		**9**
Total Credit Hours		**12**

Minor guidelines:

- All courses must be taken on a letter-grade basis
- All courses must be completed with a grade of 'C' or higher.
- Nine of the fifteen hours must be at the 3000-level or higher.
- Courses must be taken from at least three schools (at least one option must be taken in History & Sociology (HSOC) or Literature, Media, and Communication (LMC)
- At least one course presented for the minor must be a French, German, Spanish, or Russian course offered by the School of Modern Languages from the list provided or approved by the coordinator.
- Contingent upon approval of a co-coordinator, a student may count one course taken outside of the Ivan Allen college of Liberal Arts toward the minor. And, if approved by the coordinator, this course may be taken at another university.
- All Special Topics, Special Problems, and Undergraduate Research classes must be approved by the coordinator.
- A maximum of 6 semester hours of Special Topics courses may be included in the minor or the student may complete 3 semester hour of Special Topics and 3 semester hours of either Special Problems or Undergraduate Research. Student may not use 6 semester hours of either Special Problems or Undergraduate Research for a minor.

Code	Title	Credit Hours
Electives		
History and Sociology (HTS) courses		
HTS 1031	Europe Since the Renaissance	3
HTS 2036	Revolutionary Europe: 1789-1914	3
HTS 2037	Twentieth Century Europe: 1914 to Present	3
HTS 3028	Ancient Greece: Gods, Heroes, and RuinS	3
HTS 3029	Ancient Rome: From Greatness to Ruins	3
HTS 3030	Medieval Europe: 350 to 1400	3
HTS 3031	European Labor History	3
HTS 3032	Modern European Intellectual History	3
HTS 3033	Medieval England	3
HTS 3035	Britain from 1815-1914	3
HTS 3036	Britain Since 1914	3
HTS 3038	The French Revolution	3
HTS 3039	Modern France	3
HTS 3041	Modern Spain	3
HTS 3043	Modern Germany	3
HTS 3045	Nazi Germany and the Holocaust	3
HTS 3046	Science, Polilltics, and Culture in Nazi Germany	3
HTS 3048	Modern Russian History and Society	3
HTS 3063	Outposts of Empire: Comparative History of British	3
HTS 3803	Special Topics	3
HTS 3813	Special Topics	3
HTS 3823	Special Topics	3
HTS 4031	Seminar in European History	4
HTS 4699	Undergraduate Research	1-12
HTS 4813	Special Topics	3
HTS 4823	Special Topics	3
HTS 4833	Special Topics	3
HTS 4925	Special Problems in History, Technology, and Society	1-21
HTS 4926	Special Problems in History, Technology, and Society	1-21
HTS 4927	Special Problems in History, Technology, and Society	1-21
HTS 4928	Special Problems in History, Technology, and Society	1-21
HTS 4929	Special Problems in History, Technology, and Society	1-21
International Affairs (INTA) courses		
INTA 3044	Global Politics of Technology	3
INTA 3101	International Institutions	3
INTA 3120	European Security Issues	3
INTA 3121	Foreign Policies of Russia and Eurasia	3
INTA 3223	Transatlantic Relations	3
INTA 3321	Political Economy of European Integration	3
INTA 4121	Seminar in Europe: European Security	3
INTA 4803	Special Topics	3
Literature, Media, and Communication (LMC) courses		
LMC 3102	Science, Technology, and the Classical Tradition	3
LMC 3104	The Age of Scientific Discovery	3
LMC 3106	The Age of Scientific Revolution	3
LMC 3112	Evolution and the Industrial Age	3
LMC 3228	Shakespeare	3
LMC 3302	Science, Technology, and Ideology	3
LMC 3316	Science, Technology, and Postcolonialism	3
LMC 3502	Ancient and Medieval Literature and Culture	3
LMC 3504	Renaissance Literature and Culture	3
LMC 3506	Enlightenment and Culture	3
LMC 3512	British and Continental Romanticism	3
LMC 3514	Victorian Literature and Culture	3
Language courses (must select at least one)		
FREN 3000	Survey of French Literature	3
FREN 3001	French Literature from 1800 to 1900	3
FREN 3002	French Literature from 1900 to Present	3
FREN 3004	Drama Workshop	3
FREN 3011	France Today I	3
FREN 3012	France Today II	3
FREN 3014	Introduction to Contemporary France	3
FREN 3015	Social Identities in Contemporary French Culture	3

FREN 3017	Paris: Modernity Today	3
FREN 3030	French Phonetics	3
FREN 3040	Reading and Translation	3
FREN 3061	France: Culture, Economy, Commerce I	3
FREN 3062	France: Culture, Economy and Commerce II	3
FREN 3110	Comics & Graphic Arts	3
FREN 3121	Advanced Composition	3
FREN 3551	French for the Professions I	3
FREN 3691	Business Communication and Correspondence in France	3
FREN 3692	French for Business and Technology I	3
FREN 3693	French for Business and Technology II	3
FREN 3694	French for Business and Technology Abroad	3
FREN 3697	Paris in Cinema/Cinema in Paris	3
FREN 3821	Special Topics	1
FREN 3823	Special Topics	3
FREN 3833	Special Topics	3
FREN 4001	French Stylistics	3
FREN 4011	French Art	3
FREN 4013	French Literature and the Visual Arts	3
FREN 4061	French Science and Technology I	3
FREN 4101	Literature of the Francophone World I	3
FREN 4102	Literature of the Francophone World II	3
FREN 4200	Introduction to French Philosophy	3
FREN 4241	Migration in French Cinema	3
FREN 4242	The French New Wave	3
FREN 4250	Reading Les Miserables	3
FREN 4300	France and Globalization	3
FREN 4813	Special Topics	3
FREN 4823	Special Topics	3
FREN 4833	Special Topics	3
FREN 4901	Special Problems in French	1-21
FREN 4902	Special Problems in French	1-21
GRMN 3010	Introduction to German Literature	3
GRMN 3011	Germany Today	3
GRMN 3024	Conversation and Composition	3
GRMN 3026	German Stylistics	3
GRMN 3030	Crossing Borders in Literature & Culture	3
GRMN 3055	German Fairy Tales: From the Grimm Brothers to Disney	3
GRMN 3071	Introductory Business German I	3
GRMN 3110	Television & Electronic Culture	3
GRMN 3695	German Business and Technology: Structure, Communication and Correspondence	3
GRMN 3696	German Business and Technology: Current Issues	3
GRMN 3697	German Business and Technology: Communication	3
GRMN 3813	Special Topics	3
GRMN 3823	Special Topics	3
GRMN 3833	Special Topics	3
GRMN 3901	Special Problems	1-21
GRMN 4010	Perspectives of German Media	3
GRMN 4012	Typical German Towards a German Identity	3
GRMN 4023	Selected Readings in German Literature	3
GRMN 4024	German Film and Literature	3
GRMN 4025	German Culture & Film	3
GRMN 4026	German Post-Wall Cinema	3
GRMN 4027	Political Songwriting in Germany, 1945 to Present	3
GRMN 4061	Advanced Business German I	3
GRMN 4065	The European Union: History, Institutions and Current Issues and Challenges	3
GRMN 4120	Literary Representations of German History	3
GRMN 4126	Advanced Stylistics: Grammar and Discourse	3
GRMN 4691	Berlin: The Capital in the 20th Century	3
GRMN 4693	Industrial Transformation and German Society/ Economy	3
GRMN 4813	Special Topics	3
GRMN 4823	Special Topics	3
GRMN 4833	Special Topics	3
GRMN 4901	Special Problems in German	1-21
GRMN 4902	Special Problems in German	1-21
RUSS 3001	Advanced Russian I	3
RUSS 3002	Advanced Russian II	3
RUSS 3005	Russian for Heritage Speakers	3
RUSS 3222	The Russian Twentieth Century in Literature and Film	3
RUSS 3242	Urban Mythologies in Russian Literature	3
RUSS 3350	Russian and American Mass Cultures	3
RUSS 3691	Intensive Advanced Russian	3
RUSS 3692	Advanced Reading and Composition for Business, Science and Technology	3
RUSS 3695	Contemporary Russia	3
RUSS 3698	Russia Yesterday and Today	1
RUSS 3803	Special Topics	3
RUSS 3811	Special Topics	1
RUSS 3812	Special Topics	2
RUSS 3813	Special Topics	3
RUSS 3823	Special Topics	3
RUSS 3833	Special Topics	3
RUSS 4320	Nineteenth-Century Russian Writers	3
RUSS 4335	Technology, Society, and Culture in the Soviet Union and Russia	3
RUSS 4340	Invention of Business Discourse in Russia (1990-)	3
RUSS 4360	Russian Culture through the Prism of Song	3
RUSS 4692	Intensive Advanced Russian II	3
RUSS 4693	Intensive Advanced Russian III	3
RUSS 4813	Special Topics	3
RUSS 4823	Special Topics	3
RUSS 4833	Special Topics	3
RUSS 4901	Special Problems in Russian	1-21
RUSS 4902	Special Problems in Russian	1-21
SPAN 3040	A Practical Application of Spanish Grammar	3
SPAN 3050	Introduction to Reading Hispanic Literature	3

SPAN 3061	Spanish for Business I: Fundamentals	3
SPAN 3064	Medical Spanish	3
SPAN 3101	Spanish Conversation: Issues and Strategies I	3
SPAN 3111	Composition: Analysis and Development I	3
SPAN 3151	Conversation Practicum	3
SPAN 3241	The Individual and the Family in Hispanic Literature	3
SPAN 3242	Society in Hispanic Literature	3
SPAN 3691	Business Communication and Correspondence in the Hispanic	3
SPAN 3693	Science and Technology in the Hispanic World	3
SPAN 3694	Business and Culture in the Hispanic World: Seminar Abroad	3
SPAN 3697	Spanish for Health Care Professionals	3
SPAN 3698	Health Care Industry in Spain	3
SPAN 3813	Special Topics	3
SPAN 3823	Special Topics	3
SPAN 3833	Special Topics	3
SPAN 4061	Spanish for Science and Technology I: Fundamentals	3
SPAN 4062	Spanish for Science and Technology II: Applications	3
SPAN 4065	Spanish Linguistics	3
SPAN 4101	Advanced Communication Workshop	3
SPAN 4158	Social, Cultural, and Linguistic Diversity in Spain	3
SPAN 4170	Spanish Applied Linguistics	3
SPAN 4693	Sustainability in Spain	3
SPAN 4813	Special Topics	3
SPAN 4823	Special Topics	3
SPAN 4833	Special Topics	3
SPAN 4902	Special Problems in Spanish	1-21

Minor in Film and Media Studies

LMC provides minors in Film and Media Studies, Performance Studies, Science Fiction Studies, and Technical Communication. The School also co-sponsors minors in East Asian Studies; Health, Medicine, and Society; Science, Technology, and Society; and, Women, Science, and Technology.

Students wishing to pursue any of these minors should consult LMC director or associate director of undergraduate studies for detailed information concerning requirements. Courses for all minors are selected from "Courses of Instruction."

LMC also sponsors a series of certificate programs in American Literature and Culture, Film Studies, and Literary and Cultural Studies. Students should consult the LMC director or associate director of undergraduate studies for detailed information on requirements. The courses for these certificates are among those listed in "Courses of Instruction," and all fulfill humanities requirements.

LMC and the School of History and Sociology also cooperate in providing a certificate in African American Studies. Students should consult either school for detailed information concerning requirements. Courses for this certificate are selected from among those listed in "Courses of Instruction."

Film and Media Studies Minor

The School of Literature, Media, and Communication (LMC) sponsors the Film and Media Studies minor, which offers students in any major the opportunity to gain an in-depth knowledge of film and media through concentrated study in courses offered by LMC and the Schools of History and Sociology (HSOC) and Modern Languages (ML). The Film and Media Minor is largely concentrated on the rhetoric, history, theory, and broad cultural context of its subject. While is not aimed at developing skills in film or media production, those interested in gaining background in this area may take a course in video production as part of the minor.

Minor Program of Study & Guidelines

Program of Study

The Film and Media Studies minor is comprised of 15 credit hours, of which at least 12 credit hours must be upper-division coursework (numbered 3000 or above).

Code	Title	Credit Hours
Required Courses		
Select one of the following sequences:		6
LMC 2500 & LMC 3254	Introduction to Film and Film History	
LMC 2400 & LMC 3254	Introduction to Media Studies and Film History	
Select three of the following:		9
LMC 3206	Communication and Culture	
LMC 3236	Writing for the Stage and Screen	
LMC 3252	Studies in Film and Television	
LMC 3255	Cinema and Digital Culture	
LMC 3256	Major Filmmakers	
LMC 3257	Global Cinema	
LMC 3258	Documentary Film	
LMC 3259	Experimental Film	
LMC 3263	Music, Culture, and Society	
LMC 3314	Technologies of Representation	
LMC 3352	Film and/as Technology	
LMC 3404	Social Media	
LMC 3405	Media, Culture, and Society	
LMC 3406	Video Production	
LMC 3407	Advanced Video Production	
LMC 3411	The Rhetoric of Visual Communication	
Total Credit Hours		**15**

- All minor courses must be taken on a letter-grade basis and must be completed with a grade of C (2.00) or better.
- A maximum of 6 credit hours of Special Topics courses may be included in this minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or Undergraduate Research. Students may not use 6 credit hours of either Special Problems or Undergraduate Research for this minor.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.

- This minor is designed to increase the breadth of students' education. Therefore it is open to all students except those in the CM and LMC majors. CM and LMC majors interested in this topic should consult with their advisors about electing the appropriate degree thread.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in French

The School of Modern Languages offers minors in seven languages: Chinese, French, German, Japanese, Korean, Russian and Spanish. This program is designed for students of all majors who wish to develop their language skills to at least an intermediate level. The language minor demonstrates to future employers and graduate programs a sustained commitment to language and culture studies. Some language minors also welcome heritage and native speakers.

Students with previous language study who pursue a language minor can take advantage of our Advanced Standing policy to potentially earn up to 8 credits of lower-level language (1001, 1002, 2001, and/or 2002) that can count towards Core Area C or free electives and/or up to 3 credits (2002) that can count toward the language minor in Chinese, Japanese, Korean, or Russian.

The School of Modern Languages offers faculty-led study abroad programs in these language as well as our signature Language for Business and Technology (LBAT) summer abroad programs that allow students to complete up to 12 credits toward the 15-credit minor in one semester.

In addition to these seven language minors, we also a minor in Linguistics and five area studies minors: African Studies; East Asian Studies; International Business, Language, and Culture; Middle Eastern and North African Studies; Latin American and LatinX Studies.

Students interested in further advancing their language skills and intercultural competence beyond the minor, are encouraged to consider adding Applied Languages and Intercultural Studies (ALIS) as a double major, which requires only 4 to 5 more upper-level language classes than the minor. The ALIS degree is Georgia Tech's equivalent of a foreign-language major in Chinese, French, German, Japanese, Korean, Russian, or Spanish.

Students wishing to pursue one or more of these minors should declare the minor by filling out the minor change form with the Director of Undergraduate Studies in Modern Languages.

Minor Program of Study & Guidelines

Modern Language Minor Information

Program of Study

Code	Title	Credit Hours
Select 15 hours of French electives [1,2]		15
Total Credit Hours		**15**

1 Must be 3000- or 4000-level courses in French.

2 Three hours of FREN 34XX may be counted among the total hours for the minor.

- A maximum of 9 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- All courses counting toward a minor must be taken on a letter-grade basis, and a grade of C or better must be received in each course.
- A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or FREN 4699. Students may not use 6 credit hours of either Special Problems or FREN 4699 for a minor.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor

Minor in German

The School of Modern Languages offers minors in seven languages: Chinese, French, German, Japanese, Korean, Russian and Spanish. This program is designed for students of all majors who wish to develop their language skills to at least an intermediate level. The language minor demonstrates to future employers and graduate programs a sustained commitment to language and culture studies. Some language minors also welcome heritage and native speakers.

Students with previous language study who pursue a language minor can take advantage of our Advanced Standing policy to potentially earn up to 8 credits of lower-level language (1001, 1002, 2001, and/or 2002) that can count towards Core Area C or free electives and/or up to 3 credits (2002) that can count toward the language minor in Chinese, Japanese, Korean, or Russian.

The School of Modern Languages offers faculty-led study abroad programs in these language as well as our signature Language for Business and Technology (LBAT) summer abroad programs that allow students to complete up to 12 credits toward the 15-credit minor in one semester.

In addition to these seven language minors, we also a minor in Linguistics and five area studies minors: African Studies; East Asian Studies; International Business, Language, and Culture; Middle Eastern and North African Studies; Latin American and LatinX Studies.

Students interested in further advancing their language skills and intercultural competence beyond the minor, are encouraged to consider adding Applied Languages and Intercultural Studies (ALIS) as a double

major, which requires only 4 to 5 more upper-level language classes than the minor. The ALIS degree is Georgia Tech's equivalent of a foreign-language major in Chinese, French, German, Japanese, Korean, Russian, or Spanish.

Students wishing to pursue one or more of these minors should declare the minor by filling out the minor change form with the Director of Undergraduate Studies in Modern Languages.

Minor Program of Study & Guidelines

Modern Language Minor Information

Program of Study

Code	Title	Credit Hours
Select 15 hours of German electives [1,2]		15
Total Credit Hours		**15**

1 Must be 3000- or 4000-level courses in German.

2 Three hours of GRMN 34XX may be counted among the total hours for the minor.

- A maximum of 9 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- All courses counting toward a minor must be taken on a letter-grade basis, and a grade of C or better must be received in each course.
- A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or GRMN 4699. Students may not use 6 credit hours of either Special Problems or GRMN 4699 for a minor.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor

Minor in Global Development

The minor covers topics and fosters skills that are essential for all scientists, engineers, businesspeople, and policymakers who are involved with and need to understand how politics, economics, culture, and engineering interact to affect the outcome of different types of science and technology projects in the developing world. The Global Development minor teaches the concepts, theories, applications, and tools necessary for graduates to enter into such projects and work constructively with others in the Global Development community. The Global Development minor requires 15 credit hours.

Minor Program of Study & Guidelines

Program of Study

Code	Title	Credit Hours
Required Course		
INTA 2050	Intro to Global Development	3
Electives		
Select three of the following:		9
CEE 4803	Special Topics	
CP 4020	Introduction to Urban and Regional Planning	
CP 4190	Introduction to Climate Change Planning	
CP 4210	Environmental Planning and Impact Assessment	
CP 4310	Urban Transportation and Planning	
CS 4911	Design Capstone Project	
ECON 2101	The Global Economy	
ECON 3300	Economics of International Energy Markets	
ECON 4311	Strategic Economics for Global Enterprise	
ECON 4350	International Economics	
ECON 4351	International Financial Economics	
ECON 4355	Global Financial Economics	
ECON 4411	Economic Development	
ECON 4415	Conflict and Security in Developing Countries	
HTS 3055	Globalization in the Modern Era	
HTS 3064	Sociology of Development	
INTA 3773	Global Issues and Leadership	
INTA 3031	Human Rights in a Technological World	
INTA 3240	Government and Politics of Africa	
INTA 3241	Latin American Politics	
INTA 3301	International Political Economy	
INTA 3303	Political Economy of Development	
INTA 4803	Special Topics (Computers, Communication and International Development)	
INTA 4803	Special Topics (Evaluating International Development Projects)	
INTA 4803	Special Topics (Modernization and Development)	
ME 2803	Special Topics (Engineering and Global Development)	
MGT 4194	Social Enterprise and Entrepreneurship	
PUBP 4260	Economic Development Policy and Planning	
Capstone Course		
INTA/ME 4744	Global Development Capstone	3
Total Credit Hours		**15**

- All courses must be completed with grade of 'C' or higher
- A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or Undergraduate Research. Students may not use 6 credit hours of either Special Problems or Undergraduate Research for a minor.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at

another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.

- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in Health and Medical Sciences

The Health & Medical Sciences Minor is primarily geared towards students interested in pre-professional health programs or careers in medical research. The purpose of the Health & Medical Sciences Minor is to allow students with interests in a variety of fields, including medicine, exercise science, dentistry, optometry, health-related research, veterinary medicine, health informatics, pharmacy, nursing, and other allied health sciences to gain basic knowledge of the science surrounding health that will prepare them for future careers.

The purpose of the Health & Medical Sciences Minor is to encourage students to gain a basic knowledge of the science surrounding health and medicine, and prepare students for future careers in the allied health sciences. The Health & Medical Sciences Minor is designed to provide students with flexibility to pursue their interests while ensuring that students are exposed to a diversity of subject areas. Therefore, to complete the 15-credit Health & Medical Sciences Minor, students will be required take a minimum of 9 credits of classes from at least two schools other than their home school (i.e., classes with School designators-- APPH, BIOL, BIOS, CHEM, NEUR, PHYS, PSYC-- other than their major School designator) and a maximum of 6 credits from their home unit. All classes used to fulfill the Health & Medical Sciences Minor must be chosen from the approved list of health-related courses.

In addition, as is the case for all GT minors, (1) the Health & Medical Sciences Minor must include at least 9 semester hours of courses numbered 3000 or above, (2) courses used to satisfy Core Areas A through E in a student's major degree program cannot also be used to satisfy the course requirements for the minor, (3) a maximum of 6 semester hours of approved Special Topics courses may be included in the Health & Medical Sciences Minor or the student may complete 3 semester hours of Special Topics and 3 semester hours of either Special Problems or Undergraduate Research or Vertically Integrated Programs study (which would need to be pre-approved as appropriately health-related by the minor adviser), (4) a maximum of 3 semester hours of transfer credit may be used to satisfy the requirements for the minor, and (5) all courses counting toward the minor must be taken on a letter-grade basis.

Code	Title	Credit Hours
Courses approved for Health and Medical Sciences minor:		
BIOS 1107	Biological Principles	3
BIOS 1107L	Biological Principles Laboratory	1
BIOS 1108	Organismal Biology	3
BIOS 1108L	Organismal Biology Laboratory	1
BIOS 1207L	Biological Principles Project Laboratory	1
BIOS 1208L	Organismal Biology Project Laboratory	1
BIOS 2500	Introduction to Sport Science	3
BIOS 2600	Genetics	3
BIOS 2601	Genetics Laboratory	1
BIOS 2610	Integrative Genetics	3
BIOS 2611	Honors Genetics Lab	1
BIOS 2699	Undergraduate Research	1-3
BIOS 3000	Survey of Medicine	3
BIOS 3380	Microbiology	3
BIOS 3381	Microbiology Lab	1
BIOS 3450	Cell and Molecular Biology	3
BIOS 3451	Cell and Molecular Biology Lab	1
BIOS 3753	Fundamentals of Human Anatomy	3
BIOS 3754	Laboratory in Human Anatomy	1
BIOS 3755	Human Physiology	3
BIOS 3756	Physiology Laboratory	1
BIOS 4012	Protein Biology	3
BIOS 4015	Cancer Biology and Biotechnology	3
BIOS 4100	Exercise Physiology	3
BIOS 4200	Kinesiological Basis of Human Movement	3
BIOS 4340	Medical Microbiology	3
BIOS 4464	Developmental Biology	3
BIOS 4471	Behavioral Biology	3
BIOS 4480	Evolutionary Developmental Biology – How to Build an Organism	2
BIOS 4500	Drug Discovery	3
BIOS 4540	Human Motor Control	3
BIOS 4545	Genetics of Complex Human Traits and Diseases	3
BIOS 4570	Immunology	3
BIOS 4607	Molecular Biology of Microbes: Disease, Nature, and Biotechnology	3
BIOS 4651	Bioethics	3
BIOS 4668	Eukaryotic Molecular Genetics	3
BIOS 4699	Undergraduate Research	1-3
CHEM 1211K	Chemical Principles I	4
CHEM 1212K	Chemical Principles II	4
CHEM 1310	General Chemistry	4
CHEM 1315	Survey of Organic Chemistry	3
CHEM 2311	Organic Chemistry I	3
CHEM 2312	Organic Chemistry II	3
CHEM 2313	Organic and Bioorganic Chemistry	3
CHEM 2380	Synthesis Laboratory I	2
CHEM 2699	Undergraduate Research	1-3
CHEM 3511	Survey of Biochemistry	3
CHEM 4511	Biochemistry I	3
CHEM 4512	Biochemistry II	3
CHEM 4521	Biophysical Chemistry	3
CHEM 4581	Biochemistry Laboratory I	3
CHEM 4582	Biochemistry Laboratory II	3
CHEM 4760	Biocatalysis and Metabolic Engineering	3
CHEM 4765	Drug Design, Development, and Delivery	3
CHEM 4699	Undergraduate Research	1-3
NEUR 2001	Principles in Neuroscience	4
NEUR 2699	Undergraduate Research	1-3

NEUR 3001	Cell and Molecular Neuroscience	3
NEUR 3010	Methods in Neuroscience	3
NEUR 4699	Undergraduate Research	1-3
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
PHYS 2213	Introduction to Modern Physics	3
PHYS 2231	Honors Physics I	5
PHYS 2232	Honors Physics II	5
PHYS 2699	Undergraduate Research	1-3
PHYS 4251	Biophysics	3
PHYS 4699	Undergraduate Research	1-3
PSYC 1101	General Psychology	3
PSYC 2103	Human Development Over the Life Span	3
PSYC 2210	Social Psychology	3
PSYC 2699	Undergraduate Research	1-3
PSYC 2760	Human Language Processing	3
PSYC 3012	Introduction to Cognitive Psychology	3
PSYC 3020	Biopsychology	3
PSYC 3040	Sensation and Perception	3
PSYC 3790	Introduction to Cognitive Science	3
PSYC 4010	Human Abilities	3
PSYC 4020	Biopsychology	3
PSYC 4090	Cognitive Neuroscience	3
PSYC 4100	Behavioral Pharmacology	3
PSYC 4260	Psychology of Aging	3
PSYC 4699	Undergraduate Research	1-3
PSYC 4803	Special Topics (Mapping Experience and Space in the Mind)	3
PSYC 4803	Special Topics (Neuroethics)	3
PSYC 4803	Special Topics (Advanced Cognitive Neuroscience Methods)	3

Minor in Health, Medicine, and Society

The Health, Medicine, and Society minor is a program of study for undergraduate students who are interested in the health and medical professions. Humanities and social science perspectives on health and medicine equip students to address important topics, such as the ethics of biomedical research, the nature of medical discovery, the relationships among race, health, and gender, the global impact of public health, and the cost of health care delivery. Understanding these and related issues is essential to developing informed, thoughtful, and ethically enlightened leaders in the fields of health and medicine.

Program of Study

The multi-disciplinary Health, Medicine, and Society minor must comprise at least 15 credit hours, of which at least 9 credit hours are upper-division coursework (numbered 3000 or above).

A multidisciplinary minor may contain courses in a student's major field of study. A maximum of 6 credit hours of such courses may be used to satisfy the course requirements for the minor, provided these courses are not also used to satisfy any course requirement in the student's major degree program.

Code	Title	Credit Hours
Electives		
Select five of the following:		15
ECON 4510	Economics of Health and Health Care	
HTS 2080	Introduction to the History of Disease and Medicine	
HTS 3086	Sociology of Medicine and Health	
HTS 3087	History of Medicine	
HTS 3088	Race, Medicine & Science	
HTS 4086	Seminar in Health, Medicine, and Society	
LMC 3219	Literature and Medicine	
LMC 3318	Biomedicine and Culture	
PUBP 3244	Stem Cell Science, Policy, and Ethics	
PUBP 4843	Special Topics (Health Care Law, Policy, and Ethics)	
PUBP 4843	Special Topics (Health Inequalities)	
Total Credit Hours		**15**

- All courses counting toward the minor must be taken on a letter-grade basis and must be completed with a grade of C (2.00) or better.
- A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or Undergraduate Research . Students may not use 6 credit hours of either Special Problems or Undergraduate Research for a minor.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in Health Policy and Economics

Program of Study

The Health Policy and Economics minor requires students to complete a minimum of 15 semester hours in Public Policy and Economics. Courses that fulfill requirements for majors in School of Public Policy or School of Economics may also be used toward the HPE minor as described below.

Code	Title	Credit Hours
PUBP 3210	U.S. Health Policy	3
ECON 4510	Economics of Health and Health Care	3
Electives [1]		9
Group 1: Electives (must complete a minimum of 6 hours)		
PHIL 3180	Biomedical Ethics	
PUBP 3244	Stem Cell Science, Policy, and Ethics	

	PUBP 4630	Law, Medicine, and Ethics
	ECON 4401	Behavioral Economics
	PUBP 4813	Special Topics (Health Disparities)
	PUBP 4813	Special Topics (Public Health Policy in Practice)
	ECON 4803	Special Topics in Economics (Artificial Intelligence in Healthcare)
	ECON 4803	Special Topics in Economics (The Economics of Risky Health Behaviors)
Group 2: Methods		
	PUBP 3030	Policy Analysis
	ECON 3161	Econometric Analysis
	PUBP 4813	Special Topics (Cost-Benefit Analysis for Policy)
	or ECON	Cost-Benefit Analysis
Total Credit Hours		**15**

[1] A minimum of 9 credit hours of elective courses selected from the lists provided, of which a minimum of 6 credit hours must be from Group 1.

- All courses counting toward the minor must be taken on a letter-grade basis and must be completed with a grade of C (2.00) or better.
- A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or Undergraduate Research . Students may not use 6 credit hours of either Special Problems or Undergraduate Research for a minor.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in History

For students who want to broaden their educations, the study of history provides a context for understanding the world and develops analytical abilities, verbal and written communications skills, and the critical thinking that is the bedrock of active citizenship. It is also good preparation for a broad array of careers, including business, education, government, and law.

Minor Program of Study & Guidelines

Program of Study

Code	Title	Credit Hours
Select 15 credits hours of History courses. [1,2,3]		15
Total Credit Hours		**15**

[1] Nine of the 15 credit hours required must be 3000-level or higher.

[2] Three credit hours taken outside of history may be counted toward the minor, **with the approval of the school**.

[3] Students majoring in HTS may not minor in History.

- All courses counting toward the minor must be taken on a letter-grade basis and must be completed with a grade of C (2.00) or better.
- A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or Undergraduate Research. Students may not use 6 credit hours of either Special Problems or Undergraduate Research for a minor.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in Industrial Design

The minor in Industrial Design will expose students to the field of industrial design, allowing them to better work on multidisciplinary teams where design is a central element. This minor will provide interested students from other disciplines at Georgia Tech accelerated access to both the undergraduate and graduate programs in Industrial Design. The minor has three main objectives related to knowledge, skills, and application:

1. provide students with foundational knowledge of industrial design,
2. develop students' skill in working on multidisciplinary design teams, and
3. enable students to effectively apply design methods to complete exemplary design projects arising in design across disciplines.

In addition, the College of Design offers a separate undergraduate minor in Multidisciplinary Design/Arts History for students in all disciplines at Georgia Tech. The minor requires completion of one of three available core survey sequences in the history of design, in addition to four courses from at least three lists of courses in: history of architecture, the history of industrial design, the history of the city/landscape/garden, history of art and foreign study, and music history. Architecture and industrial design program students must select a core-survey sequence outside their major, or select two additional electives from approved lists.

Interested students should see the Undergraduate Minors page and consult with an academic advisor for more details.

- Minor in Industrial Design
- Minor Program of Study & Guidelines

Program of Study

This minor must comprise at least 15 credit hours, of which at least 9 credit hours are upper-division coursework (numbered 3000 or above).

Code	Title	Credit Hours
Required Courses		
ID 2320	Human Factors in Design	3
ID 2401	Visual Design Thinking	3
ID 3320	Design Methods: User Centered Design	3
ID 4833	Special Topics: Collaborative	3
Electives		
Select one of the following:		3
ID 3301	Materials I: Renewables	
ID 3302	Materials and Processes II: Nonrenewables	
ID 3510	Introduction to Interactive Product Design	
ID 3520	Tangible Interaction	
ID 4106	Parametric Product Modeling	
ID 4201	Design/Research Methods	
ID 4206	Culture of Objects: A Seminar on the Design and Culture of Objects	
ID 4210	Introduction to Universal Design in the Built Environment	
ID 4320	Prototyping Interaction: Designing for Experience	
Total Credit Hours		**15**

- All courses must be taken on letter-grade basis and must be completed with a grade of C (2.00) or better.
- A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or Undergraduate Research. Students may not use 6 credit hours of either Special Problems or Undergraduate Research for a minor.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in International Affairs

The minor in International Affairs program offers specialized instruction in the globalization of politics, economics, and the increasing interdependence of states, and is especially useful for students preparing for graduate school or careers in internationally oriented fields. The minor provides instruction in fundamental skills for students to acquire significant knowledge to understand world politics and international affairs.

Minor Program of Study & Guidelines

Program of Study

Code	Title	Credit Hours
Required Courses		
INTA 1110	Introduction to International Relations	3
Select one course at the 2000-level (not INTA 2010).		3
Electives		
Select elective INTA courses to fulfill 18 credit hour requirement. [1]		12
Total Credit Hours		**18**

[1] Numbered 3000 or above.

- All courses must be taken on a letter-grade basis, and a C or better must be received in each course.
- A student may seek permission from the School to allow 3 credit hours of upper-division, non-INTA coursework to count toward the completion of the minor if that coursework is clearly relevant to International Affairs.
- A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or Undergraduate Research. Students may not use 6 credit hours of either Special Problems or Undergraduate Research for a minor.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in International Business, Language, and Culture

The School of Modern Languages and the Scheller College of Business offer an interdisciplinary minor in "International Business, Language, and Culture" (IBLC) housed in the School of Modern Languages. Two key objectives of the Institute's strategic plan are to "prepare students for global leadership" and "innovate to amplify social responsibility and economic impact." In order to achieve these objectives students need to understand the fundamentals of business and also be able to communicate across different languages and culture. This minor meets both of these objectives. Currently, the IBLC minor can be pursued in the following languages: Chinese, French, German, Japanese, Korean, Russian, and Spanish. This minor welcomes both business and non-business majors.

Students who wish to pursue this minor should declare the minor by completing the minor change form with the Student Advisor in Modern Languages.

Minor Program of Study & Guidelines

Modern Language Minor Information

Program of Study for Business Majors

Code	Title	Credit Hours
Business Majors Requirements		
Select two of the following courses:		6
MGT 3118	Cross-cultural Management	
MGT 3606	International Business Law	
MGT 3661	Advanced Concepts in International Business	
MGT 4030	International Accounting	
MGT 4070	International Finance	
MGT 4116	The Role of Gender, Race and Ethnicity in Organizational Behavior	
MGT 4335	International Marketing	
MGT 4803	Special Topics in Industrial Management (Global Strategy)	
Select three 3000/4000-level courses in the same language. At least one must come from the list below.		9
CHIN 3021	Chinese Society and Culture I	
CHIN 3022	Chinese Society and Culture II	
CHIN 3692	Business Chinese	
CHIN 3696	Economic Development and Sustainability in China [1]	
FREN 3011	France Today I	
FREN 3012	France Today II	
FREN 3014	Introduction to Contemporary France [1]	
FREN 3061	France: Culture, Economy, Commerce I	
FREN 3062	France: Culture, Economy and Commerce II	
FREN 3551	French for the Professions I	
FREN 3691	Business Communication and Correspondence in France [1]	
FREN 3692	French for Business and Technology I [1]	
FREN 3693	French for Business and Technology II [1]	
FREN 3694	French for Business and Technology Abroad [1]	
FREN 4300	France and Globalization	
GRMN 3011	Germany Today	
GRMN 3071	Introductory Business German I	
GRMN 3695	German Business and Technology: Structure, Communication and Correspondence [1]	
GRMN 3696	German Business and Technology: Current Issues [1]	
GRMN 4061	Advanced Business German I	
GRMN 4693	Industrial Transformation and German Society/ Economy [1]	
JAPN 3692	Business Japanese [1]	
JAPN 3693	Japan Today [1]	
JAPN 4123	Technical and Business Japanese Translation	
KOR 3691	Business Korean [1]	
KOR 3692	Current Issues and Technology in Korea [1]	
RUSS 3691	Intensive Advanced Russian [1]	
RUSS 3692	Advanced Reading and Composition for Business, Science and Technology [1]	
RUSS 4340	Invention of Business Discourse in Russia (1990-)	
SPAN 3211	Spain Today	
SPAN 3235	Latin America Today	
SPAN 3590	Issues of Sustainable Development in the Andean Region [1]	
SPAN 3592	Culture and Commerce in the Andes [1]	
SPAN 3690	Commerce and Sustainable Communities [1]	
SPAN 3691	Business Communication and Correspondence in the Hispanic [1]	
SPAN 3692	Business and Culture in the Hispanic World [1]	
SPAN 3693	Science and Technology in the Hispanic World [1]	
SPAN 4251	Hispanic Community Internship	
SPAN 4693	Sustainability in Spain [1]	

CHIN/ FREN/ GRMN/ JAPN/ KOR/ RUSS/ SPAN 3813/ CHIN 3823/ FREN/ GRMN/ JAPN/ KOR/ RUSS/ SPAN 3823/ CHIN 3833/ FREN/ GRMN/ JAPN/ KOR/ RUSS/ SPAN 3833/ CHIN 4813/ FREN/ GRMN/ JAPN/ KOR/ RUSS/ SPAN 4813/ CHIN 4823/ FREN/ GRMN/ JAPN/ KOR/ RUSS/ SPAN 4823/ CHIN 4833/ FREN/ GRMN/ JAPN/ KOR/ RUSS/ SPAN 4833	Special Topics
CHIN 4695 or FREN or GRMN or JAPN or RUSS or SPAN	Chinese Internship / French Internship / German Internship / Japanese Internship / Russian Internship / Spanish Internship
Total Credit Hours	**15**

[1] Study Abroad course

General Notes:

- All courses must be taken on a letter-grade basis and a grade of 'C' or higher must be received in each course.
- No more than three hours of coursework can be complete at another university, and this must be approved by the advisor.

Program of Study for Non-Business Majors

Code	Title	Credit Hours
Non-Business Majors Requirements		
Required Courses:		
MGT 3000	Financial and Managerial Accounting	3
MGT 3660	International Business	3
Select one of the following courses:		3
MGT 2210	Information Systems and Digital Transformation	
MGT 3078	Finance and Investments	
MGT 3300	Marketing Management I	
MGT 3150	Principles of Management	
MGT 3661	Advanced Concepts in International Business	
MGT 3606	International Business Law	
Select two 3000/4000-level courses in the same language. At least one must come from the list below.		6
CHIN 3021	Chinese Society and Culture I	
CHIN 3022	Chinese Society and Culture II	
CHIN 3692	Business Chinese	
CHIN 3696	Economic Development and Sustainability in China [1]	
FREN 3011	France Today I	
FREN 3012	France Today II	
FREN 3014	Introduction to Contemporary France [1]	
FREN 3061	France: Culture, Economy, Commerce I	
FREN 3062	France: Culture, Economy and Commerce II	
FREN 3551	French for the Professions I	
FREN 3691	Business Communication and Correspondence in France [1]	
FREN 3692	French for Business and Technology I [1]	
FREN 3693	French for Business and Technology II [1]	
FREN 3694	French for Business and Technology Abroad [1]	
FREN 4300	France and Globalization	
GRMN 3011	Germany Today	
GRMN 3071	Introductory Business German I	
GRMN 3695	German Business and Technology: Structure, Communication and Correspondence [1]	
GRMN 3696	German Business and Technology: Current Issues [1]	
GRMN 4061	Advanced Business German I	
GRMN 4693	Industrial Transformation and German Society/ Economy [1]	
JAPN 3692	Business Japanese [1]	
JAPN 3693	Japan Today [1]	
JAPN 4123	Technical and Business Japanese Translation	
KOR 3691	Business Korean [1]	
KOR 3692	Current Issues and Technology in Korea [1]	
RUSS 3691	Intensive Advanced Russian [1]	

RUSS 3692	Advanced Reading and Composition for Business, Science and Technology [1]
RUSS 4340	Invention of Business Discourse in Russia (1990-)
SPAN 3211	Spain Today
SPAN 3235	Latin America Today
SPAN 3590	Issues of Sustainable Development in the Andean Region [1]
SPAN 3592	Culture and Commerce in the Andes [1]
SPAN 3690	Commerce and Sustainable Communities [1]
SPAN 3691	Business Communication and Correspondence in the Hispanic [1]
SPAN 3692	Business and Culture in the Hispanic World [1]
SPAN 3693	Science and Technology in the Hispanic World [1]
SPAN 4251	Hispanic Community Internship
SPAN 4693	Sustainability in Spain [1]
CHIN/ FREN/ GRMN/ JAPN/ KOR/ RUSS/ SPAN 3813/ CHIN 3823/ FREN/ GRMN/ JAPN/ KOR/ RUSS/ SPAN 3823/ CHIN 3833/ FREN/ GRMN/ JAPN/ KOR/ RUSS/ SPAN 3833/ CHIN 4813/ FREN/ GRMN/ JAPN/ KOR/ RUSS/ SPAN 4813/ CHIN 4823/ FREN/ GRMN/ JAPN/ KOR/ RUSS/ SPAN 4823/ CHIN 4833/ FREN/ GRMN/ JAPN/ KOR/ RUSS/ SPAN 4833	Special Topics
CHIN 4695 or FREN 4695 or GRMN 4695 or JAPN 4695 or RUSS 4695 or SPAN 4695	Chinese Internship French Internship German Internship Japanese Internship Russian Internship Spanish Internship
Total Credit Hours	**15**

[1] Study Abroad course

General Notes:

- All courses must be taken on a letter-grade basis and a grade of 'C' or higher must be received in each course.

- No more than three hours of coursework can be complete at another university, and this must be approved by the advisor.

Minor in Japanese

The School of Modern Languages offers minors in seven languages: Chinese, French, German, Japanese, Korean, Russian and Spanish. This program is designed for students of all majors who wish to develop their language skills to at least an intermediate level. The language minor demonstrates to future employers and graduate programs a sustained commitment to language and culture studies. Some language minors also welcome heritage and native speakers.

Students with previous language study who pursue a language minor can take advantage of our Advanced Standing policy to potentially earn up to 8 credits of lower-level language (1001, 1002, 2001, and/or 2002) that can count towards Core Area C or free electives and/or up to 3 credits (2002) that can count toward the language minor in Chinese, Japanese, Korean, or Russian.

The School of Modern Languages offers faculty-led study abroad programs in these language as well as our signature Language for Business and Technology (LBAT) summer abroad programs that allow students to complete up to 12 credits toward the 15-credit minor in one semester.

In addition to these seven language minors, we also a minor in Linguistics and five area studies minors: African Studies; East Asian Studies; International Business, Language, and Culture; Middle Eastern and North African Studies; Latin American and LatinX Studies.

Students interested in further advancing their language skills and intercultural competence beyond the minor, are encouraged to consider adding Applied Languages and Intercultural Studies (ALIS) as a double major, which requires only 4 to 5 more upper-level language classes than the minor. The ALIS degree is Georgia Tech's equivalent of a foreign-language major in Chinese, French, German, Japanese, Korean, Russian, or Spanish.

Students wishing to pursue one or more of these minors should declare the minor by filling out the minor change form with the Director of Undergraduate Studies in Modern Languages.

Minor Program of Study & Guidelines

Modern Language Minor Information

Program of Study

Code	Title	Credit Hours
Select 15 hours of Japanese electives [1,2,3]		15
Total Credit Hours		**15**

1. Must be beyond 2002 (or, equivalent-see advisor), 3000-, or 4000-level courses in Japanese.
2. At least twelve credit hours must be 3000-level or higher.
3. Three hours of JAPN 34XX may be counted among the total hours for the minor.

- A maximum of 9 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- All courses counting toward a minor must be taken on a letter-grade basis, and a grade of C or better must be received in each course.
- A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or JAPN 2699 JAPN 2699 JAPN 2699 or JAPN 4699. Students may not use 6 credit hours of either Special Problems or JAPN 2699 or JAPN 4699 for a minor.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor

Minor in Korean

The School of Modern Languages offers minors in seven languages: Chinese, French, German, Japanese, Korean, Russian and Spanish. This program is designed for students of all majors who wish to develop their language skills to at least an intermediate level. The language minor demonstrates to future employers and graduate programs a sustained commitment to language and culture studies. Some language minors also welcome heritage and native speakers.

Students with previous language study who pursue a language minor can take advantage of our Advanced Standing policy to potentially earn up to 8 credits of lower-level language (1001, 1002, 2001, and/or 2002) that can count towards Core Area C or free electives and/or up to 3 credits (2002) that can count toward the language minor in Chinese, Japanese, Korean, or Russian.

The School of Modern Languages offers faculty-led study abroad programs in these language as well as our signature Language for Business and Technology (LBAT) summer abroad programs that allow students to complete up to 12 credits toward the 15-credit minor in one semester.

In addition to these seven language minors, we also a minor in Linguistics and five area studies minors: African Studies; East Asian Studies; International Business, Language, and Culture; Middle Eastern and North African Studies; Latin American and LatinX Studies.

Students interested in further advancing their language skills and intercultural competence beyond the minor, are encouraged to consider adding Applied Languages and Intercultural Studies (ALIS) as a double major, which requires only 4 to 5 more upper-level language classes than the minor. The ALIS degree is Georgia Tech's equivalent of a foreign-language major in Chinese, French, German, Japanese, Korean, Russian, or Spanish.

Students wishing to pursue one or more of these minors should declare the minor by filling out the minor change form with the Director of Undergraduate Studies in Modern Languages.

Minor Program of Study & Guidelines

Modern Language Minor Information

Program of Study

Code	Title	Credit Hours
Select 15 hours of Korean electives [1,2,3]		15
Total Credit Hours		**15**

1 Must be 2002 (or, equivalent-see advisor), 3000-, or 4000-level courses in Korean.

2 At least twevle credit hours must be 3000-level or higher.

3 Three hours of KOR 34XX may be counted among the total hours for the minor.

- A maximum of 9 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- All courses counting toward a minor must be taken on a letter-grade basis, and a grade of C or better must be received in each course.
- A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or KOR 2699 or KOR 4699. Students may not use 6 credit hours of either Special Problems or KOR 2699 or KOR 4699 for a minor.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor

Minor in Law, Science, and Technology

The School of Public Policy is home to Georgia Tech's Law, Science, and Technology/Pre-Law Program. This program offers a wide range of curricular opportunities as well as pre-law advising and support services for students considering law school and careers in law.

The program introduces students to selected areas of law that they are likely to study in law school. Students will begin to develop the skills that they will need to succeed in law school and in law practice. Some of the courses are taught by full-time faculty, while others are taught by attorneys from the Atlanta area, thereby exposing students to academic and practical perspectives on the practice of law.

The program welcomes students from every college and major. Students majoring in the sciences and engineering may be surprised to learn that their undergraduate background gives them a strong start toward specializations such as intellectual property law, products liability law, and construction law.

Minor Program of Study & Guidelines

Program of Study

Code	Title	Credit Hours
Required Courses		
Select one of the following:		3
PUBP 3000 American Constitutional Issues		
PUBP 3016 Judicial Process		
PUBP 3610 Pre-Law Seminar		
PUBP 4609 Legal Practice		
Electives		
Select elective PUBP courses to fulfill 15 credit hour requirement. [1]		12
Total Credit Hours		**15**

1 Numbered 3000 or above.

- All courses must be taken on letter-grade basis and completed with a grade of C (2.00) or better.
- No more than 9 credit hours of Special Topics courses may be included in a minor program.
- Students who began the LST minor prior to Fall 2003, may apply under an earlier set of guidelines. Please see Director of the Pre-Law Program for details.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in Leadership Studies

The Minor in Leadership Studies has as its primary objective the goal of providing students with an in-depth knowledge of leadership theory, skills, experience, and application through a rigorous program of study that is multi-disciplinary in nature. The minor is comprised of three tracks: Global Engineering, Public Policy and Business, offered through the School of Civil and Environmental Engineering, School of Public Policy and the ILE respectively. Students apply for a specific track, are accepted, and enter the program to begin a prescribed 15 credit hour course of study while satisfying requirements for a bachelor's degree in their major.

Application and course descriptions are available at: http://leadership.gatech.edu

Application and course descriptions are available in the Minor Program of Study & Guidelines section of this catalog.

GPA Requirement

In order for a student to be enrolled in this minor, they must have at least thirty credit hours with a cumulative GPA of 2.5 or greater, have applied for admission, and been formally admitted. Each course counting toward the minor must be completed with a grade of **C** or above, with the overall

required GPA in the courses counting toward the minor being a 2.75 or better.

Program of Study - Business Track (for Business Administration majors)

Code	Title	Credit Hours
Capstone Cluster [1]		3
MGT 4189	Social Impact: In-depth Exploration & Design	
MGT 4369	Sustainable Business Consulting Practicum	
MGT 4611	Integrative Management Analysis	
Elective Cluster [2]		12
MGT 3103	Leadership in a Changing Environment	
MGT 3118	Cross-cultural Management	
MGT 3607	Business Ethics	
MGT 3662	Management in the Healthcare Sector	
MGT 4072	Entrepreneurial Finance	
MGT 4102	Management Consulting	
MGT 4116	The Role of Gender, Race and Ethnicity in Organizational Behavior	
MGT 4119	Leading Teams in Organizations	
MGT 4193	Servant Leadership, Values & Systems	
MGT 4194	Social Enterprise and Entrepreneurship	
MGT 4670	Entrepreneurship	
MGT 4191	The Entrepreneurship Forum	
or MGT 4192	Impact Speaker Series Forum	
MGT 4803	Special Topics in Management [3]	
PUBP 4140	Foundations of Leadership	
Total Credit Hours		**15**

1 Select at least 1 and at most 2 courses from the options listed.
2 Select one of two options: (1) Select 4 courses (2) Select 3 courses if you selected 2 from the Capstone Cluster.
3 See below for list of approved Special Topic courses

Approved Special Topics Courses

Code	Title	Credit Hours
MGT 4803	Special Topics in Management (Business Fundamentals for Social Entrepreneurs)	3
MGT 4803	Special Topics in Management (Leadership Development)	3
MGT 4803	Special Topics in Management (Negotiation)	3
MGT 4803	Special Topics in Management (Strategic Entrepreneurship)	3
MGT 4803	Special Topics in Management (Work, Equity, and Wellness)	3

- A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or Undergraduate Research. Students may not use 6 credit hours of either Special Problems or Undergraduate Research for a minor.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the major advisor's responsibility to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Program of Study - Business Track (for non-Business Administration majors)

Code	Title	Credit Hours
Required Courses		
PUBP 4140	Foundations of Leadership	3
Capstone Cluster [1]		3
MGT 4189	Social Impact: In-depth Exploration & Design	
MGT 4369	Sustainable Business Consulting Practicum	
MGT 4611	Integrative Management Analysis	
Elective Cluster [2]		9
MGT 3102	Managing Human Resources within a Regulatory Environment	3
MGT 3103	Leadership in a Changing Environment	3
MGT 3118	Cross-cultural Management	3
MGT 3607	Business Ethics	3
MGT 3662	Management in the Healthcare Sector	3
MGT 4072	Entrepreneurial Finance	3
MGT 4102	Management Consulting	3
MGT 4116	The Role of Gender, Race and Ethnicity in Organizational Behavior	3
MGT 4119	Leading Teams in Organizations	3
MGT 4193	Servant Leadership, Values & Systems	3
MGT 4194	Social Enterprise and Entrepreneurship	3
MGT 4670	Entrepreneurship	3
MGT 3101	Organizational Behavior	3
or MGT 3150	Principles of Management	
MGT 4191	The Entrepreneurship Forum	3
or MGT 4192	Impact Speaker Series Forum	
MGT 4803	Special Topics in Management [3]	3
Total Credit Hours		**60**

1 Select at least 1 and at most 2 courses from the options listed.
2 Select one of two options: (1) Select 3 courses (2) Select 2 courses if you selected 2 from the Capstone Cluster.
3 See below for list of approved Special Topic courses

Approved Special Topics Courses

Code	Title	Credit Hours
MGT 4803	Special Topics in Management (Leadership Development)	3
MGT 4803	Special Topics in Management (Negotiation)	3

MGT 4803	Special Topics in Management (Strategic Entrepreneurship)	3
MGT 4803	Special Topics in Management (Work, Equity, and Wellness)	3

- A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or Undergraduate Research. Students may not use 6 credit hours of either Special Problems or Undergraduate Research for a minor.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the major advisor's responsibility to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Program of Study - Global Engineering Track

Code	Title	Credit Hours
Required Courses		
PUBP 4140	Foundations of Leadership	3
CEE 4000	Global Engineering Leadership	3
Select at least 3 of the following from the Engineering Track:		9
CEE 4350	Environmental Technology in the Developing World	
CEE 4150	Construction Management & Megaprojects	
CEE 4460	International Disaster Reconnaissance	
CEE 4660	Sustainable Transportation Abroad	
CEE 4803	Special Topics (Smart and Sustainable Cities)	
CEE 4803	Special Topics (Origami Engineering)	
Internship [1]		
INTN 3011	International Internship Spring Term (Global Engineering Leadership Experience)	
Total Credit Hours		**15**

[1] Students may also select a Global Engineering Leadership Development Internship.

- A maximum of 3 semester hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the major advisor's responsibility to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Program of Study - Policy Track

Code	Title	Credit Hours
Required Courses		
PUBP 4140	Foundations of Leadership	3
Select at least 3 courses from the Policy Track:		9
PHIL 3050	Political Philosophy	
PUBP 2010	Political Processes	
PUBP 2030	Organizations and Policy	
PUBP 4803	Special Topics [1]	
Internship		
PUBP 4651	Public Policy Internship	3
Total Credit Hours		**15**

[1] See below list of approved Special Topic courses. Students may use up to 12 hours of Special Topics courses from approved list.

Approved Special Topics Courses

Code	Title	Credit Hours
PUBP 4803	Ethical Responsibility in Leadership	
PUBP 4813	Managerial and Leadership Skill Building	
PSYC 4803	Exploring Multicultural Identities	

- A maximum of 6 semester hours of Special Topics courses may be included in a minor program or the student may complete 3 semester hours of Special Topics and 3 semester hours of either Special Problems or Undergraduate Research. Students may not use 6 semester hours of either Special Problems or Undergraduate Research for a minor.
- A maximum of 3 semester hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the major advisor's responsibility to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in Linguistics

The Schools of Modern Languages, Psychology, and Computer Science offer an interdisciplinary minor in Linguistics, housed in the School of Modern Languages. While the students are advised by the Linguistics advisor (Modern Languages), the minor coursework is delivered by faculty in Modern Languages, Psychology and Computer Science. The minor connects studies of the physical structures and mental processes involved in human language; the psychological, neurobiological, and social/societal factors that enable humans to acquire, use, comprehend and produce language; and the application of computer science to the

analysis and synthesis of language and speech. This minor is designed for undergraduates who will enter a wide range of careers, especially, language education, educational design, programming, human/computer interaction, etc.

Students wishing to pursue this minor should declare the minor by filling out the minor change form with the Student Advisor in Modern Languages.

Minor Program of Study & Guidelines

Modern Language Minor Information

Program of Study

General notes:

- All courses towards the Minor must be taken for a letter grade, with a grade of C or better.
- At most two Special Topics courses can count towards the Minor and require approval from the Linguistics Advisor.
- At least 9 of the 15 credits (3 courses) must be 3000-level or above.

Code	Title	Credit Hours
Required Course		
LING 2100	Introduction to Linguistics	3
Choose 4 electives [1]		12
Total Credit Hours		**15**

[1] Electives may come from the following:

- Any LING course(s)
- Any foreign-language Modern Languages course (3000-level or above) substantially involving linguistics (for example, German/Japanese Applied Linguistics; French Phonetics; Spanish Sociolinguistics; Kaleidoscope of Chinese Languages; etc), with approval of the Program Coordinator. Please note that some 3000-level foreign-language courses may require a placement test.)
- Any (at most one) Psychology course substantially involving language (for example, Human Language Processing; Introduction to Cognitive Science, etc), with approval of the Program Coordinator.
- Any (at most one) Computer Science course substantially involving language (for example, Natural Language Processing; Natural Language Understanding; etc), with approval of the Program Coordinator. (Please note that Computer Science courses may have pre-requisites.)
- Any (at most one) LING course taught at Emory, Georgia State, or any other accredited university, with approval of the Program Coordinator.

Minor in Materials Science and Engineering

The School of Materials Science and Engineering (MSE) offers an undergraduate minor in materials science and engineering for non-MSE majors. The purpose of the minor is to broaden the materials background of non-materials science and engineering students and to introduce them to a materials approach to problem solving that may be different from that provided by their major.

Fifteen hours of MSE courses are required for the minor, of which at least twelve semester hours are upper-division coursework (i.e., courses numbered 3000 or above). The depth of the program of study should ensure that upon completion, the student will have met the educational objectives established for the minor. Many students will be able to complete a considerable portion of the minor requirements by scheduling MSE courses as electives required by their major.

Non-MSE undergraduate majors are encouraged to participate in this program provided they have the appropriate prerequisites and approval of their home school academic advisor. To participate or for additional information, contact the associate chair for Undergraduate Programs in the School of Materials Science and Engineering.

Minor Program of Study & Guidelines

Materials Science Minor Information

Program of Study

Code	Title	Credit Hours
Select 15 credit hours of MSE coursework [1]		15
Total Credit Hours		**15**

[1] Twelve hours must be 3000-level or higher courses.

- All courses counting toward the minor must be taken on a letter-grade basis and all courses used to satisfy the course requirements for a minor must be completed with a grade of C (2.00) or better.
- A maximum of 3 credit hours of Special Topics courses may be included in a minor program.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in Mathematics

The Mathematics minor consists of 15 semester hours chosen from MATH 2106 and Mathematics courses 3000 level or higher.

For further information, consult the departmental advisor.

Minor Program of Study & Guidelines

Math: Minor Information

Program of Study

Code	Title	Credit Hours
Mathematics minor requirements		
MATH 2106, MATH 3000-level or higher [1]		15

[1] MATH 2106 is not required but may be used toward the required 15 hours.

General Notes:

- It is the major advisor's responsibility to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.
- A maximum of 3 semester hours of Special Topics courses may be used to satisfy the course requirements for a minor.
- A maximum of 3 semester hours of Undergraduate Research credit may be used to satisfy the course requirements for a minor.
- No Special Problems or Internship coursework may be used.
- All courses used to satisfy the course requirements for a minor must be completed with a grade of C (2.00) or better.higher.
- Courses must be completed on a letter grade mode.
- A maximum of 3 semester hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- A maximum of 3 semester hours of credit earned by an Advanced Standing Examination can be used to satisfy the course requirements for a minor.
- At most one of MATH 3215, MATH 3225, and MATH 3670 can be included in the minor. At most one of MATH 3406 and MATH 4305 can be included in the minor.
- Institute undergraduate minor guidelines must be satisfied.

Minor in Middle Eastern and North African Studies

The Schools of History and Sociology, International Affairs, and Modern Languages offer a minor in Middle Eastern and North African Studies. This interdisciplinary minor connects studies of the regions and countries in the Middle East—their languages, their cultures, and their peoples, both concurrently in their national and international relationships as well as longitudinally over the course of history. This minor is designed for undergraduates who will enter a wide range of careers that can lead directly or indirectly to interactions with the people, the social organizations and businesses, and governments of the Middle East and North Africa, both abroad and here in the U.S., especially in terms of the critical technological, social, and policy decisions facing the world today.

Students wishing to pursue this minor should declare the minor by filling out the minor change form with the Student Advisor in Modern Languages.

Minor Program of Study & Guidelines

Modern Language Minor Information

The MENAS Minor requires 15 credits of coursework of which nine or more credits must be at the 3000- or 4000-level.

Students may count up to six credits of lower-level foreign language coursework in Arabic, French, Hebrew, or Persian from the following list:

ARBC 1002, ARBC 2001, ARBC 2002

FREN 2001, FREN 2002, FREN 2005

HEBW 1002, HEBW 2001, HEBW 2002

PERS 1002, PERS 2001, PERS 2002

If counting two lower-level language courses, they must be in the same language group.

Students (e.g. native and heritage speakers) who can demonstrate language proficiency equivalent to the 2002 level or above in any one of these four MENAS languages, may choose two lower-level courses in English for up to six credits if they have a MENAS focus (e.g. ARBC 2301, HTS 2040, HTS 2041, INTA 2260, ML 2500, etc.)

Students must complete nine credits or more of 3000- and 4000-level coursework as part of the 15-credit total for the MENAS minor.

Students may count:

· Any 3000- or 4000-level course in Arabic, Hebrew, or Persian.

· Any 3000- or 4000-level course in French with significant treatment of MENAS topics such as Francophone Africa, North Africa, the Maghreb, or French African Diasporas (e.g. FREN 4101, FREN 4102, FREN 4103, FREN 4105, FREN 4107).

· Any 3000- or 4000-level course in HSOC with significant treatment of topics related to the Middle East and/or North Africa (e.g. HTS 3051 and some relevant offerings of HTS 4061 and HTS 4091)

· Any 3000- or 4000-level course in INTA with significant treatment of topics related to the Middle East and/or North Africa (e.g. INTA 3240, INTA 3260).

For questions regarding course selection and approval, please contact the MENAS minor coordinator.

Notes:

1) All students must show language competency equivalent to having successfully passed ARBC 2001 or above, HEBW 2001 or above, PERS 2001 or above, or FREN 2002 or above. To show language competency without taking lower-level language courses, students must successfully pass internal proficiency exams from the School of Modern Languages at Georgia Tech or demonstrate the required minimum level through a recent official proficiency test such as ACTFL's Oral Proficiency Interview (OPI).

2) A maximum of 6 hours of Special Topics is allowed

3) All courses must be taken on a letter-grade basis and a grade of C or better must be received in each course.

4) A maximum of 9 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.

5) It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course

requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in Naval Science

The minor in Naval Science will familiarize the student with basic and advanced concepts of Naval Science with emphasis on naval history, technology, and leadership. The Institute's motto of "Progress and Service" is embodied in military service. This minor will support the students who plan to serve their country by recognizing their academic achievement outside of their major coursework. The minor will also give students who do not pursue military service a basic working knowledge of the United States Navy and Marine Corps. Concepts learned complement any chosen career path.

Program of Study

Code	Title	Credit Hours
Select 15 hours from the following courses:		
NS 1321	Introduction to Naval Sciences	3
NS 1323	Naval Maritime History	3
NS 2321	Naval Leadership and Management	3
NS 2323	Navigation	3
NS 3323	Evolution of Warfare	3
NS 3325	Naval Weapons Systems	3
NS 3326	Naval Engineering Systems	3
NS 4320	Naval Operations and Seamanship	3
NS 4322	Naval Leadership and Ethics	3
NS 4333	Fundamentals of Maneuver Warfare	3

A minimum of 9 credit hours of upper-division coursework must constitute the required 15 credit hours of minor coursework. Students may not repeat any course for double credit. Courses may be taken in any order, but students are highly encouraged to complete NS 1321 before enrolling in any other courses.

Minor in Nuclear Radiological Engineering

The Nuclear & Radiological Engineering and Health Physics Program of the Woodruff School offers a certificate and a minor in Nuclear & Radiological Engineering to non-NRE engineering students. These programs provide a general knowledge of Nuclear and Radiological Engineering topics and are valuable for students considering graduate work in Nuclear Engineering or Medical Physics.

Minor Program of Study & Guidelines

Program of Study

The NRE minor must comprise at least 15 credit hours, of which at least 12 credit hours are upper-division coursework (numbered 3000 or above).

Code	Title	Credit Hours
Required Courses		
NRE 2120	Elements of Nuclear and Radiological Engineering	3
NRE 3301	Radiation Physics	3
NRE Electives [1]		**9**
Total Credit Hours		**15**

[1] The remaining 9 credit hours can be selected from any NRE course (excluding NRE 4699 and NRE 4903). At least 6 hours must be 3000-level or higher and at least 3 hours must be at the 4000-level.

Other minor guidelines:

- All courses counting toward the minor must be taken on a letter-grade basis.
- Each course used to satisfy the course requirements for a minor must be completed with a grade of C (2.00) or better.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in Philosophy

Program of Study

Code	Title	Credit Hours
Required Courses		
PHIL 3103	Modern Philosophy	3
PHIL 3115	Philosophy of Science	3
Electives		
Select 9 credit hours of the following electives, at least 6 of which are upper-division: [1]		9
INTA 2030	Ethics in International Affairs	
PHIL 2010	Introduction to Philosophical Analysis	
PHIL 2025	Philosophical Analysis of Policy Choices	
PHIL 3050	Political Philosophy	
PHIL 3102	Ancient Philosophy	
PHIL 3105	Ethical Theories	
PHIL 3109	Engineering Ethics	
PHIL 3113	Logic and Critical Thinking	
PHIL 3127	Science, Technology, and Human Values	
PHIL 3135	Philosophy of Technology	
PHIL 3140	Philosophy of Food	
PHIL 4110	Theories of Knowledge	
PHIL 4752	Philosophical Issues in Computation	
PHIL 4174	Perspectives in Science and Technology	
PHIL 4176	Environmental Ethics	
PHIL 4803	Special Topics	

[1] Numbered 3000 or above.

- All courses counting toward the minor must be taken on a letter-grade basis.
- All courses used to satisfy the course requirements for a minor must be completed with a grade of C (2.00) or better.
- A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or Undergraduate Research. Students may not use 6 credit hours of either Special Problems or Undergraduate Research for a minor.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in Physics

A minor in physics is intended to provide an in-depth study of physics to non-physics majors entering into a global and diverse workforce where a multidisciplinary science and engineering background is increasingly common. It will also serve those students who, through elective physics course studies, have developed a greater interest in the discipline, or who plan to enter graduate school in an area where a strong physics background is useful.

The objective of the minor is to strengthen the student's knowledge of the fundamental physical concepts underlying all of modern science and engineering. The minor will help the student develop analytical problem-solving skills and reinforce their ability to engage in scientific thinking.

Minor Program of Study & Guidelines

Program of Study

The physics minor consists of 15 credit hours. At most 3 credit hours of laboratory may be included among the 15 credit hours.

Code	Title	Credit Hours
Required Courses		
PHYS 2213	Introduction to Modern Physics	3
PHYS 3143	Quantum Mechanics I	3
Select one of the following:		3
PHYS 3201	Classical Mechanics I	
PHYS 3122	Electrostatics and Magnetostatics	
PHYS 3141	Thermodynamics	
Electives		
Select elective PHYS courses to fulfill 15 credit hour requirement. [1]		6
Total Credit Hours		**15**

[1] 3000 and 4000 level courses.

- All courses counting toward the minor must be taken on a letter-grade basis.
- All courses used to satisfy the course requirements for a minor must be completed with a grade of C (2.00) or better.
- A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or Undergraduate Research. Students may not use 6 credit hours of either Special Problems or Undergraduate Research for a minor.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in Physiology

Physiology is a highly integrative and complex discipline that provides the foundation for careers in many areas of scientific research, engineering design, clinical practice and public policy. As such, the School of Biological Sciences within the College of Sciences supports this minor concentration in Physiology. The School of Biological Sciences already offers a certificate; thus, the ability to offer a minor with a modest increase in credit hours is feasible and within the capacity of the host School. The curriculum includes both core courses and electives that are currently offered, and provides fundamental training in the structure and function of the human body (anatomy and physiology) as well as in-depth areas within the discipline (muscle physiology, exercise physiology, motor control, neuroanatomy, kinesiology, nutrition) and applications of this knowledge (sport science, medicine).

Minor Program of Study & Guidelines

Program of Study

Code	Title	Credit Hours
Required Courses		
BIOS 3753	Fundamentals of Human Anatomy	3
BIOS 3755	Human Physiology	3
Biological Sciences Electives [1,2]		**9**
BIOS Elective options (a minimum of 6 BIOS hours is required):		
BIOS 2500	Introduction to Sport Science	
BIOS 3000	Survey of Medicine	
BIOS 3450	Cell and Molecular Biology	
BIOS 3451	Cell and Molecular Biology Lab	
BIOS 3754	Laboratory in Human Anatomy	
BIOS 3756	Physiology Laboratory	
BIOS 4100	Exercise Physiology	
BIOS 4200	Kinesiological Basis of Human Movement	
BIOS 4238	Ion Channels	

	BIOS 4400	Human Neuroanatomy
	BIOS 4418	Microbial Physiology
	BIOS 4464	Developmental Biology
	BIOS 4540	Human Motor Control
	BIOS 4699	Undergraduate Research
	BIOS 4803	Special Topics
Non-BIOS elective options:		
	BMED 3100	Systems Physiology
	ECE 4781	Biomedical Instrumentation
	LMC 3318	Biomedicine and Culture
	ME 4757	Biofluid Mechanics
	ME 4758	Biosolid Mechanics
	PSYC 2230	Abnormal Psychology
	PSYC 3020	Biopsychology
	PSYC 4090	Cognitive Neuroscience
	PSYC 4100	Behavioral Pharmacology
	NEUR 3001	Cell and Molecular Neuroscience
Total Credit Hours		**15**

[1] Students must complete a minimum of 6 credit hours of BIOS courses. The remaining 3 credit hours of electives may be selected from the listed non-BIOS elective options or may be selected from the BIOS courses.

[2] A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or Undergraduate Research. Students may not use 6 credit hours of either Special Problems or Undergraduate Research for a minor. BIOS 4699 or BIOS 4803 must be approved by the minor advisor.

- Students must earn 'C' or higher in each minor course (no pass/fail credits)
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in Political Science

The discipline of political science is included within the Ivan Allen College within the School of Public Policy and the Sam Nunn School of International Affairs. Undergraduate courses in political science are intended to broaden students' perceptions of political processes and governmental institutions. Many of these courses are taught under the PUBP or INTA prefix. Students should consult with the political science faculty concerning course offerings.

Political science courses may be used to satisfy the distribution requirement in social sciences, including the state-mandated requirement on constitutions of the United States and Georgia. This requirement may be satisfied by examination or completion of:

Code	Title	Credit Hours
Select one of the following:		3
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
INTA 1200	American Government in Comparative Perspective	
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
Total Credit Hours		**3**

Certificate and minor programs in political science, administered by the School of Public Policy, are available for students who wish to concentrate coursework in this discipline.

Code	Title	Credit Hours
Required Courses		
Select five of the following: [1]		15
INTA 2210	Comparative Political Philosophies and Ideologies	
POL 2101	State and Local Government	
PHIL 3050	Political Philosophy	
PUBP 2012	Foundations of Public Policy	
PUBP 3000	American Constitutional Issues	
PUBP 3016	Judicial Process	
PUBP 3201	Introduction to Social Policy	
PUBP 3214	African American Politics	
PUBP 4120	Survey Research Methods	
PUBP 4200	Social Policy Issues	
PUBP 4212	Women and Public Policy	
PUBP 4226	Business and Government	
PUBP 4410	Science, Technology, and Public Policy	
PUBP 4416	Critical Issues in Science and Technology	
PUBP 4514	Mass Communication Policy	
Total Credit Hours		**15**

[1] Select at least 12 credit hours of upper-division coursework (numbered 3000 or above). A student may seek permission from the School of Public Policy to allow 3 credit hours of upper division coursework taught outside the School to count toward the completion of the minor if that coursework is clearly relevant to Political Science.

Certificate in Political Science

The certificate in political science requires twelve hours of coursework (at least nine hours at the 3000 level), chosen in consultation with the faculty coordinator.

Minor Program of Study & Guidelines

Program of Study

The Political Science minor must comprise at least 15 semester hours, of which at least 12 semester hours are upper-division coursework (numbered 3000 or above).

Code	Title	Credit Hours
Required Courses		
Select five of the following: [1]		15
INTA 2210	Comparative Political Philosophies and Ideologies	
POL 2101	State and Local Government	
PHIL 3050	Political Philosophy	
PUBP 2012	Foundations of Public Policy	
PUBP 3000	American Constitutional Issues	
PUBP 3016	Judicial Process	
PUBP 3201	Introduction to Social Policy	
PUBP 3214	African American Politics	
PUBP 4120	Survey Research Methods	
PUBP 4200	Social Policy Issues	
PUBP 4212	Women and Public Policy	
PUBP 4226	Business and Government	
PUBP 4410	Science, Technology, and Public Policy	
PUBP 4416	Critical Issues in Science and Technology	
PUBP 4514	Mass Communication Policy	
Total Credit Hours		**15**

[1] Select at least 12 credit hours of upper-division coursework (numbered 3000 or above). A student may seek permission from the School of Public Policy to allow 3 credit hours of upper division coursework taught outside the School to count toward the completion of the minor if that coursework is clearly relevant to Political Science.

- A course may not be used to satisfy the requirements of more than one minor or certificate.
- All courses counting toward the minor must be taken on a letter-grade basis.
- All courses used to satisfy the course requirements for a minor must be completed with a grade of C (2.00) or better.
- A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or Undergraduate Research. Students may not use 6 credit hours of either Special Problems or Undergraduate Research for a minor.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in Psychology

A minor in psychology is available to all non-psychology majors. The minor program provides a foundation in research methods and statistics and allows the student to take upper level courses in various areas of psychology. This minor is valuable for students who wish to have a background in psychology while pursuing other majors and considering graduate school in psychology or related fields. Further information is available on the School's web site.

Minor Program of Study & Guidelines

Program of Study

Code	Title	Credit Hours
Psychology minor courses		
Select 15 credit hours of electives, at least 9 of which are upper-divison. [3]		15

- No more than 6 credit hours of Advanced Standing may be included in a minor program.
- All courses counting toward the minor must be taken on a letter-grade basis.
- All courses used to satisfy the course requirements for a minor must be completed with a grade of C (2.00) or better.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.
- The minor will be conferred at the same time the degree is conferred and the degree and minor will be recorded on the student's transcript. The minor will not appear on the diploma. Minors may not be conferred retroactively upon students who have graduated.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- A course may not be used to satisfy the requirements of more than one minor or certificate.
- A maximum of 3 credit hours of Special Problems or Undergraduate research courses may be included in a minor program.
- A maximum of 3 credit hours of Special Topics courses may be included in a minor program.

Minor in Public Policy

There are many interfaces between the realm of public policy and nearly every program of study at Georgia Tech. Engineering, the sciences, management, architecture, computing, and the liberal arts are impacted by – and affect – the decisions made by governments. The minor and certificate in Public Policy allow Georgia Tech students to develop the multidisciplinary thinking skills that are needed for strategic decision

making in business and technical professions as well as law and public policy.

Certificate in Public Policy

The certificate program consists of twelve credit hours of coursework.

Minor Program of Study & Guidelines

Program of Study

Students pursuing the minor should have their program of study approved in writing by the public policy minor supervisor before enrolling in a course they intend to count toward the minor. A student may seek prior permission from the School of Public Policy to allow 3 credit hours of upper-division coursework in public policy taught outside the School to count toward the completion of the minor. Contact the School for the current public policy minor supervisor.

Code	Title	Credit Hours
Required Course		
POL 1101	Government of the United States [1]	3
Electives		
Select 15 credit hours of PUBP electives, at least 12 of which are upper-divison. [2]		15
Total Credit Hours		**18**

1 POL 1101 or equivalent as determined by the administrator of the minor program is required i**n addition** to the 15 credit hours for the minor.

2 Numbered 3000 or above. A student may seek permission from the School of Public Policy to allow 3 credit hours of upper-division coursework taught outside the School to count toward the completion of the minor if that coursework is clearly relevant to Public Policy.

- A course may not be used to satisfy the requirements of more than one minor or certificate.
- All courses counting toward the minor must be taken on a letter-grade basis.
- All courses used to satisfy the course requirements for a minor must be completed with a grade of C (2.00) or better.
- A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or Undergraduate Research. Students may not use 6 credit hours of either Special Problems or Undergraduate Research for a minor.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in Robotics

The Schools of Aerospace Engineering, Biomedical Engineering, Electrical and Computer Engineering, Interactive Computing, and Mechanical Engineering offer a minor in robotics for students majoring in any discipline.

The Robotics Minor provides a concentrated experience in the multidisciplinary field of robotics.

Program of Study

Code	Title	Credit Hours
Required Robotics Courses		
Select one course:		3
CS 3630	Introduction to Perception and Robotics	
ECE 4560	Introduction to Automation and Robotics	
ME 4451	Robotics	
BMED 4739	Medical Robotics	
Elective Courses		
Choose at least one course from 2 of the 4 core categories:		12
Autonomy		
AE 4552	Introduction to Humans & Autonomy	
CS 3600	Introduction to Artificial Intelligence	
CS 4641	Machine Learning	
CS 4649	Robot Intelli Planning	
ECE 4555	Embedded and Hybrid Control Systems	
Controls		
AE 3531	Control System Analysis and Design	
or ECE 3[illegible]	Feedback Control Systems	
or ME 44	Control of Dynamic Systems	
ECE 4550	Control System Design	
ME 4012	Modeling and Control of Motion Systems	
ME 4405	Fundamentals of Mechatronics	
Mechanics		
AE 2220	Dynamics	
or CEE 20[illegible]0	namics	
or ME 220[illegible]2	ynamics of Rigid Bodies	
AE 3530	System Dynamics and Vibration	
ME 4189	Structural Vibrations	
Perception		
BMED 3500	Biomedical Sensors and Instrumentation	
BMED/ECE 4781	Biomedical Instrumentation	
BMED/ECE 4783	Introduction to Medical Image Processing	
CS 4476	Introduction to Computer Vision	
CS 4616	Pattern Recognition	
ECE 2026	Introduction to Signal Processing	
ECE 4180	Embedded Systems Design	
ECE 4271	Applications of Digital Signal Processing	
Total Credit Hours		**15**

AE/BMED/ME/ECE/CS 4699 Undergraduate Research in robotics or autonomous systems (3 hours) may be used to fulfill one of the 4 core

requirements. This research must be completed with a robotics faculty member and requires a final report that highlights its linkage to the respective core: Autonomy, Controls, Mechanics, and Perception.

Additional Restrictions on the 15 hours of credit for the Robotics Minor:

- At least two courses must be taken outside of the student's home school. Cross-listed courses, such as those marked with an * in the list above, cannot count as being "outside the home school" for any of the students who are from the schools that cross list that course.
- Courses must be taken from two or more schools.
- All courses from the minor must be passed with a grade of C or higher.
- No more than one 2000-level course may be used towards the minor.
- No course that is required (by name and number) in the student's major discipline can be counted towards the student's minor. No course that is considered equivalent to a required course in the student's major is allowed for the minor.
- No course counted towards the Robotics Minor can be used for any other undergraduate minor or certificate.

Minor in Russian

The School of Modern Languages offers minors in seven languages: Chinese, French, German, Japanese, Korean, Russian and Spanish. This program is designed for students of all majors who wish to develop their language skills to at least an intermediate level. The language minor demonstrates to future employers and graduate programs a sustained commitment to language and culture studies. Some language minors also welcome heritage and native speakers.

Students with previous language study who pursue a language minor can take advantage of our Advanced Standing policy to potentially earn up to 8 credits of lower-level language (1001, 1002, 2001, and/or 2002) that can count towards Core Area C or free electives and/or up to 3 credits (2002) that can count toward the language minor in Chinese, Japanese, Korean, or Russian.

The School of Modern Languages offers faculty-led study abroad programs in these language as well as our signature Language for Business and Technology (LBAT) summer abroad programs that allow students to complete up to 12 credits toward the 15-credit minor in one semester.

In addition to these seven language minors, we also a minor in Linguistics and five area studies minors: African Studies; East Asian Studies; International Business, Language, and Culture; Middle Eastern and North African Studies; Latin American and LatinX Studies.

Students interested in further advancing their language skills and intercultural competence beyond the minor, are encouraged to consider adding Applied Languages and Intercultural Studies (ALIS) as a double major, which requires only 4 to 5 more upper-level language classes than the minor. The ALIS degree is Georgia Tech's equivalent of a foreign-language major in Chinese, French, German, Japanese, Korean, Russian, or Spanish.

Students wishing to pursue one or more of these minors should declare the minor by filling out the minor change form with the Director of Undergraduate Studies in Modern Languages.

Minor Program of Study & Guidelines

Modern Language Minor Information

Program of Study

Code	Title	Credit Hours
Select 15 hours of Russian coursework [1,2,3,4]		15

1. Must be 2002 (or, equivalent-see advisor), 3000-, or 4000-level Russian courses
2. Russian Program Director may substitute up to 3 credit hours of Russian-focused INTA or LMC courses to fulfill minor requirements, if necessary.
3. At least twelve credit hours must be taken at the 3000 level or above.
4. Three hours of RUSS 34XX may be counted among the total hours for the minor.

Other minor guidelines

- A maximum of 9 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- All courses counting toward a minor must be taken on a letter-grade basis, and a grade of C or better must be received in each course.
- A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or RUSS 2699 RUSS 2699RUSS 2699 or RUSS 4699. Students may not use 6 credit hours of either Special Problems or RUSS 2699 RUSS 2699RUSS 2699 or RUSS 4699 for a minor.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in Science of Mental Health and Well-Being

Program of Study

Code	Title	Credit Hours
PSYC 3803	Special Topics (Neuroscience of Mental Health: Research and Practice)	3
Select one of the following:		3
PSYC 3000	Science of Stress, Anxiety, and Happiness	
PSYC 3005	Mindfulness: Science and Practice	
PSYC 3009	Health Psychology	
Select 9 hours from the following: [1]		9
PSYC 2005	Exploring Multicultural Identities	
PSYC 2103	Human Development Over the Life Span	
PSYC 2210	Social Psychology	
PSYC 2230	Abnormal Psychology	
PSYC 2240	Personality Theory	
PSYC 3000	Science of Stress, Anxiety, and Happiness	

PSYC 3005	Mindfulness: Science and Practice
PSYC 3009	Health Psychology
PSYC 3012	Introduction to Cognitive Psychology
PSYC 3040	Sensation and Perception
PSYC 4010	Human Abilities
PSYC 4020	Biopsychology
PSYC 4025	Learning and Memory
PSYC 4260	Psychology of Aging
PSYC 4270	Psychological Testing

[1] At least 6 hours must be 3000/4000-level

- No more than 6 credit hours of Advanced Standing may be included in a minor program.
- All courses counting toward the minor must be taken on a letter-grade basis.
- All courses used to satisfy the course requirements for a minor must be completed with a grade of C (2.00) or better.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.
- The minor will be conferred at the same time the degree is conferred and the degree and minor will be recorded on the student's transcript. The minor will not appear on the diploma. Minors may not be conferred retroactively upon students who have graduated.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- A course may not be used to satisfy the requirements of more than one minor or certificate.
- A maximum of 3 credit hours of Special Problems or Undergraduate research courses may be included in a minor program.
- A maximum of 3 credit hours of Special Topics courses may be included in a minor program.

Minor in Science, Technology, and Society

LMC provides minors in Film and Media Studies, Performance Studies, and Technical Communication. The School also co-sponsors minors in

- East Asian Studies;
- Health, Medicine, and Society;
- Science, Technology, and Society; and
- Women, Science, and Technology.

Students wishing to pursue any of these minors should consult LMC for detailed information concerning requirements. Courses for all minors are selected from "Courses of Instruction."

LMC also sponsors a series of certificate programs in American Literature and Culture, Film Studies, and Literary and Cultural Studies. Students should consult the LMC director of undergraduate studies for detailed information on requirements. The courses for these certificates are among those listed in "Courses of Instruction," and all fulfill humanities requirements.

LMC and the School of History and Sociology also cooperate in providing a certificate in African American Studies. Students should consult either school for detailed information concerning requirements. Courses for this certificate are selected from among those listed in "Courses of Instruction" and from the list offered by.

The Science, Technology, and Society minor will provide a context for understanding how science and technology fits within our social world, past and present. It offers students a better understanding of how science and technology develop and change, how they are represented and understood in culture, and how various social and historical contexts shape science and technology. This area of study also develops analytical abilities, verbal and written communications skills, and the critical thinking. It is good preparation for a broad array of careers, including business, education, government, and law.

Minor Program of Study & Guidelines

Program of Study

The multi-disciplinary Science, Technology, and Society minor must comprise at least 15 semester hours, of which at least 9 semester hours are upper-division coursework (numbered 3000 or above).

A multidisciplinary minor may contain courses in a student's major field of study. A maximum of 6 credit hours of such courses may be used to satisfy the course requirements for the minor, provided these courses are not also used to satisfy any course requirement in the student's major degree program.

Three credit hours taken outside of STS courses may be counted toward the minor, **with approval of the HTS minor advisor.**

Code	Title	Credit Hours
Required Courses		
Select two of the following: [1]		6
HTS 1081	Engineering in History	
HTS 2080	Introduction to the History of Disease and Medicine	
HTS 2081	The Scientific Revolution	
HTS 2082	Technology and Science in the Industrial Age	
HTS 2084	Technology and Society	
HTS 2100	Sci, Tech & Modern World	
HTS 3001	American Economic History	
HTS 3007	Sociology of Work, Industry, and Occupations	
HTS 3020	Gender and Technology	
HTS 3021	Women in Science and Engineering	
HTS 3046	Science, Poliltics, and Culture in Nazi Germany	
HTS 3076	History of Intelligence and National Security	
HTS 3080	History of Rocketry	
HTS 3081	Technology and the Environment	
HTS 3082	Sociology of Science	

HTS 3083	Technology and the Shaping of American Society	
HTS 3084	Culture and Technology	
HTS 3085	Law, Technology, and Politics	
HTS 3086	Sociology of Medicine and Health	
HTS 3087	History of Medicine	
Select two of the following: [1]		6
LMC 3102	Science, Technology, and the Classical Tradition	
LMC 3104	The Age of Scientific Discovery	
LMC 3106	The Age of Scientific Revolution	
LMC 3112	Evolution and the Industrial Age	
LMC 3214	Science Fiction	
LMC 3219	Literature and Medicine	
LMC 3302	Science, Technology, and Ideology	
LMC 3304	Science, Technology, and Gender	
LMC 3306	Science, Technology, and Race	
LMC 3308	Environmentalism and Ecocriticism	
LMC 3318	Biomedicine and Culture	
LMC 3352	Film and/as Technology	
Select 3 credit hours from any of the above courses. [1]		3
Total Credit Hours		**15**

[1] The multi-disciplinary Science, Technology, and Society minor must comprise at least 15 credit hours, of which at least 9 credit hours of upper-division coursework (numbered 3000 or above).

- All courses counting toward the minor must be taken on a letter-grade basis and must be completed with a grade of C (2.00) or better.
- A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or Undergraduate Research. Students may not use 6 credit hours of either Special Problems or Undergraduate Research for a minor.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in Science Fiction Studies

LMC provides minors in Film and Media Studies, Performance Studies, Science Fiction Studies, and Technical Communication. The School also co-sponsors minors in East Asian Studies; Health, Medicine, and Society; Science, Technology, and Society; and, Women, Science, and Technology.

Students wishing to pursue any of these minors should consult LMC director or associate director of undergraduate studies for detailed information concerning requirements. Courses for all minors are selected from "Courses of Instruction."

LMC also sponsors a series of certificate programs in American Literature and Culture, Film Studies, and Literary and Cultural Studies. Students should consult the LMC director or associate director of undergraduate studies for detailed information on requirements. The courses for these certificates are among those listed in "Courses of Instruction," and all fulfill humanities requirements.

LMC and the School of History and Sociology also cooperate in providing a certificate in African American Studies. Students should consult either school for detailed information concerning requirements. Courses for this certificate are selected from among those listed in "Courses of Instruction."

The minor in Science Fiction Studies (SFS) is for students who are interested in learning how people communicate the experience of science and technology across centuries, continents, and cultures. The two core LMC classes required for this minor teach students the history of science fiction across media. The three electives required to complete this minor enable students to connect their study of science fiction to issues of social justice, ethics, artistic practice, and the historic relations of science, technology, and culture. Students who pursue this minor will develop the analytic skills and creative mindsets that are crucial for graduate school and for advancements in careers ranging from education to engineering.

Please note: This minor is not allowed for BSLMC or BSCM students. LMC and CM students interested in science fiction studies should consult with their advisors about selecting an equivalent degree thread or creating a science fiction studies concentration.

Minor Program of Study & Guidelines

Program of Study

The Science Fiction Studies minor is comprised of least 15 credit hours, of which at least 9 credit hours are upper-division coursework (numbered 3000 or above).

Code	Title	Credit Hours
Required Courses		
LMC 3214	Science Fiction	3
LMC 3215	Science Fiction Film and Television	3
Electives		
Select three of the following:		9
LMC 3112	Evolution and the Industrial Age	
LMC 3219	Literature and Medicine	
LMC 3234	Creative Writing	
LMC 3302	Science, Technology, and Ideology	
LMC 3304	Science, Technology, and Gender	
LMC 3306	Science, Technology, and Race	
LMC 3308	Environmentalism and Ecocriticism	
LMC 3310	The Rhetoric of Scientific Inquiry	
LMC 3316	Science, Technology, and Postcolonialism	
LMC 3352	Film and/as Technology	
Total Credit Hours		**15**

[1] with approval of the Director of Undergraduate Studies

- All courses counting toward this minor must be taken on a letter-grade basis and courses used to satisfy the course requirements for a minor must be completed with a grade of C (2.00) or better.
- A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or Undergraduate Research. Students may not use 6 credit hours of either Special Problems or Undergraduate Research for a minor. Permission from LMC Advisor, LMC DUS, or LMC ADUS is required when requesting to use a special topics course toward the minor.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in Scientific and Engineering Computing

The Scientific and Engineering Computing minor provides undergraduate students with computational and numerical skills and knowledge to augment their studies in their major programs. Core courses in mathematics and computing provide broad, general skills in numerical methods, algorithms, and scientific software development. Elective courses provide depth in applying numerical computation to problems in the field of the student's major.

Computational methods are now used routinely in virtually all fields of science and engineering, and are becoming more common in the social sciences. They have become essential to understand natural and human-created phenomena and systems. Computation has been described as the third paradigm for scientific discovery and innovation, along with theory and experimentation. A minor curriculum in computation is a natural complement to major programs in science, engineering and the social sciences.

Minor Program of Study & Guidelines

Program of Study

A CS Minor application is required.

The Scientific and Engineering Computing minor must comprise at least 15 credit hours, of which at least 9 credit hours are upper-division coursework (numbered 3000 or above).

Code	Title	Credit Hours
Prerequisites		
Math through Calculus III and Differential Equations		
CS 1331	Introduction to Object Oriented Programming [1]	
Required Courses		
CX 4010	Computational Problem Solving for Scientists and Engineers [2,4]	3
Numerical Methods		
Select one of the following: [3]		3
AE 3090	Numerical Methods for Aerospace Engineering	
CHBE 2120	Numerical Methods in Chemical Engineering	
CX 4640	Numerical Analysis I	
MATH 4640	Numerical Analysis I	
ME 2016	Computer Applications	
MSE 3025	Statistics and Numerical Methods in Materials Science and Engineering	
Intro to Parallel Computing		
Select one of the following:		3
CX 4220	Introduction to High Performance Computing	
CX 4777	Introduction to Parallel and Vector Scientific Computing	
MATH 4777	Vector and Parallel Scientific Computation	
Electives		
Select two of the following:		6
AE 4040	Computational Fluid Dynamics	
AE 4132	Finite Element Analysis	
BMED 4783	Introduction to Medical Image Processing	
CS 4710	Introduction to Computing Concepts for Bioinformatics	
CX 4140	Computational Modeling Algorithms	
CX 4230	Computer Simulation	
CX 4240	Introduction to Computing for Data Analysis	
CX 4641	Numerical Analysis II	
CX 4777	Introduction to Parallel and Vector Scientific Computing	
CX 4803	Special Topics in Computational Science and Engineering (Computational Sustainability)	
ECE 4580	Computational Computer Vision	
ECE 4783	Introduction to Medical Image Processing	
ECE 4823	Special Topics (Computational Methods in Electrical Engineering)	
MATH 4261	Mathematical Statistics I	
MATH 4305	Topics in Linear Algebra	
MATH 4581	Classical Mathematical Methods in Engineering	
MATH 4641	Numerical Analysis II	
MATH 4777	Vector and Parallel Scientific Computation	
ME 4342	Computational Fluid Dynamics	
NRE 4234	Nuclear Criticality Safety Engineering	
PHYS 3266	Computational Physics	
Total Credit Hours		**15**

[1] CS 1331 is a pre-requisite for the minor and must be taken, but not included in the required 15 credit hours. A grade of A or B is required.

[2] Computer engineering students should take both CX 4220 and CX 4777/MATH 4777 rather than CX 4010.

[3] If Numerical Methods is required by the student's Major, then the student may take an additional elective. Numerical Methods courses

include (ECE and computer engineering students are restricted to taking AE 3090, CX 4640/MATH 4640, or MSE 3025)

- No Special Problems or Internships coursework may be used towards the CS minor.
- A grade of A or B is required for CS 1331. All courses used to satisfy the course requirements for a minor must be completed with a grade of C (2.00) or better.
- All courses counting toward the minor must be taken on a letter-grade basis.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in Social Justice

LMC provides minors in Film and Media Studies, Performance Studies, Science Fiction Studies, and Technical Communication. The School also co-sponsors minors in East Asian Studies; Health, Medicine, and Society; Science, Technology, and Society; and, Women, Science, and Technology.

Students wishing to pursue any of these minors should consult LMC director or associate director of undergraduate studies for detailed information concerning requirements. Courses for all minors are selected from "Courses of Instruction."

LMC also sponsors a series of certificate programs in American Literature and Culture, Film Studies, and Literary and Cultural Studies. Students should consult the LMC director or associate director of undergraduate studies for detailed information on requirements. The courses for these certificates are among those listed in "Courses of Instruction," and all fulfill humanities requirements.

LMC and the School of History and Sociology also cooperate in providing a certificate in African American Studies. Students should consult either school for detailed information concerning requirements. Courses for this certificate are selected from among those listed in "Courses of Instruction."

The minor in Social Justice is for undergraduate students who are interested in incorporating an in-depth awareness of social issues into their fields of study and careers. Humanities and social science classes included in the minor address issues of equity and inclusiveness in relation to historical, cultural, social, economic, political, and/or techno-scientific factors. Students develop the analytic skills, social understanding, and creative mindsets needed to become informed, ethical, and innovative problem solvers and leaders in an increasingly global and technological world. The minor in Social Justice supports the missions of the Institute's Strategic Plan and its Quality Enhancement Plan.

Minor Program of Study & Guidelines

Program of Study

A multidisciplinary minor may contain courses in a student's major field of study. A maximum of 6 credit hours of such courses may be used to satisfy the course requirements for the minor, provided these courses are not also used to satisfy any course requirement in the student's major degree program.

The multi-disciplinary Social Justice minor must comprise at least 15 credit hours, of which at least 9 credit hours are upper-division coursework (numbered 3000 or above).

Code	Title	Credit Hours
Requirements		
Select two of the following:		6
HTS 2016	Social Issues and Public Policy	
HTS 3005	American Environmental History	
HTS 3006	United States Labor History	
HTS 3008	Class, Power, and Social Inequality	
HTS 3011	The City in American History	
HTS 3016	Women and Gender in the United States	
HTS 3017	Sociology of Gender	
HTS 3020	Gender and Technology	
HTS 3022	Gender and Sports	
HTS 3023	Slaves without Masters: Free People of Color before 1865	
HTS 3024	African American History to 1865	
HTS 3025	African American History since 1865	
HTS 3026	Sociology of Race and Ethnicity	
HTS 3027	The Civil Rights Movement	
HTS 3031	European Labor History	
HTS 3051	Women and the Politics of Gender in the Middle East	
HTS 3064	Sociology of Development	
HTS 3066	Sociology of Politics and Society	
HTS 3067	Revolutionary Movements in the Modern World	
HTS 3068	Social Movements	
HTS 3071	Sociology of Crime	
HTS 3088	Race, Medicine & Science	
SOC 1101	Introduction to Sociology	
Select two of the following:		6
LMC 2200	Introduction to Gender Studies	
LMC 2350	Introduction to Social Justice	
LMC 3208	African American Literature and Culture	
LMC 3210	Ethnicity in American Culture	
LMC 3212	Women, Literature, and Culture	
LMC 3225	Gender Studies in the Disciplines	
LMC 3302	Science, Technology, and Ideology	
LMC 3304	Science, Technology, and Gender	
LMC 3306	Science, Technology, and Race	
LMC 3308	Environmentalism and Ecocriticism	
LMC 3314	Technologies of Representation	
LMC 3316	Science, Technology, and Postcolonialism	

LMC 3318 Biomedicine and Culture	
Select one additional course from above or SOCI 1101	3
SOC 1101 Introduction to Sociology	
Total Credit Hours	**15**

- All courses counting toward the minor must be taken on a letter-grade basis and must be completed with a grade of C (2.00) or better.
- A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or Undergraduate Research. Students may not use 6 credit hours of either Special Problems or Undergraduate Research for a minor.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in Sociology

For students in other majors interested in broadening their educational experience at Georgia Tech, the School of History and Sociology offers minors in history; sociology; Health, Medicine, and Society; Science, Technology, and Society; Sports, Society, and Technology; and participates in the interdisciplinary minors in Social Justice; and Women, Science, and Technology.

The study of sociology develops analytical abilities, verbal and written communication skills, and invaluable critical tools for understanding the contemporary world. Sociology is good preparation for a broad array of careers, including business, education, public administration, and social work.

Minor Program of Study & Guidelines

Program of Study

Code	Title	Credit Hours
Select 15 hours of Sociology coursework [1,2,3]		15
Total Credit Hours		**15**

1. At least 9 credit hours must be upper-division coursework (numbered 3000 or above).
2. Three credit hours taken outside of sociology may be counted toward the minor, **with the approval of the school**.
3. Students majoring in HTS may not minor in Sociology.

- All courses counting toward the minor must be taken on a letter-grade basis and must be completed with a grade of C (2.00) or better.
- A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or Undergraduate Research. Students may not use 6 credit hours of either Special Problems or Undergraduate Research for a minor.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in Spanish

The School of Modern Languages offers minors in seven languages: Chinese, French, German, Japanese, Korean, Russian and Spanish. This program is designed for students of all majors who wish to develop their language skills to at least an intermediate level. The language minor demonstrates to future employers and graduate programs a sustained commitment to language and culture studies. Some language minors also welcome heritage and native speakers.

Students with previous language study who pursue a language minor can take advantage of our Advanced Standing policy to potentially earn up to 8 credits of lower-level language (1001, 1002, 2001, and/or 2002) that can count towards Core Area C or free electives and/or up to 3 credits (2002) that can count toward the language minor in Chinese, Japanese, Korean, or Russian.

The School of Modern Languages offers faculty-led study abroad programs in these language as well as our signature Language for Business and Technology (LBAT) summer abroad programs that allow students to complete up to 12 credits toward the 15-credit minor in one semester.

In addition to these seven language minors, we also a minor in Linguistics and five area studies minors: African Studies; East Asian Studies; International Business, Language, and Culture; Middle Eastern and North African Studies; Latin American and LatinX Studies.

Students interested in further advancing their language skills and intercultural competence beyond the minor, are encouraged to consider adding Applied Languages and Intercultural Studies (ALIS) as a double major, which requires only 4 to 5 more upper-level language classes than the minor. The ALIS degree is Georgia Tech's equivalent of a foreign-language major in Chinese, French, German, Japanese, Korean, Russian, or Spanish.

Students wishing to pursue one or more of these minors should declare the minor by filling out the minor change form with the Director of Undergraduate Studies in Modern Languages.

Minor Program of Study & Guidelines

Modern Language Minor Information

Program of Study

Code	Title	Credit Hours
Select 15 hours of Spanish courses [1]		15
Total Credit Hours		**15**

[1] Must be 3000- or 4000-level Spanish courses

- A maximum of 9 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- All courses counting toward a minor must be taken on a letter-grade basis, and a grade of C or better must be received in each course.
- A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or SPAN 4699. Students may not use 6 credit hours of either Special Problems or SPAN 4699 for a minor.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in Sports, Society, and Technology

For students in other majors interested in broadening their educational experience at Georgia Tech, the School of History and Sociology offers minors in history; sociology; Health, Medicine, and Society; Science, Technology, and Society; Sports, Society, and Technology; and participates in the interdisciplinary minors in Social Justice; and Women, Science, and Technology.

The Sports, Society, and Technology minor draws upon the interdisciplinary field of sports studies and is appealing to undergraduate students interested in the critical, holistic study of sport. The minor includes coursework from such diverse areas as architecture, international studies, applied physiology, business law, economics, history, and sociology. Examples of topics covered in the minor include:

- the legal and economic impact of sports;
- the historical and contemporary relationships between technology, race, nationality, gender and sports;
- sports science, technology and performance; and
- public policy and global sports infrastructure.

Since this curriculum focuses on the critical study of sports, it is particularly attractive for those interested in acquiring the breadth of knowledge and critical thinking skills that numerous employers say they are seeking in college graduates. SST coursework also helps students become innovative leaders in our local and global communities. Therefore SST coursework is good preparation for graduate school, community service or a broad array of careers including those in the sports and health industries, education, government and law.

Minor Program of Study & Guidelines

Program of Study

A multidisciplinary minor may contain courses in a student's major field of study. A maximum of 6 credit hours of such courses may be used to satisfy the course requirements for the minor, provided these courses are not also used to satisfy any course requirement in the student's major degree program.

In addition to the courses listed here, there are other courses offered less regularly—for example, Special Topics and Undergraduate Research classes---that may count toward the minor. The SST adviser should be consulted for guidance. Three credit hours taken outside of SST courses may be counted toward the minor, **with the approval of the SST minor advisor.**

Code	Title	Credit Hours
Required Courses		
Select five of the following: [1]		15
BIOS 2500	Introduction to Sport Science	
HTS 2015	History of Sports in America	
HTS 3022	Gender and Sports	
HTS 3073	Sociology of Sports	
HTS 3075	Foundations of Sports Studies	
INTA 3242	Soccer and Global Politics	
ECON 4520	Economics of Sports	
MGT 4803	Special Topics in Industrial Management [3]	
MSE 3300	Materials Science & Engineering of Sports	
ARCH 4803	Special Topics	
Total Credit Hours		**15**

[1] At least 9 credit hours must be at the 3000 level or above.

[2] Required prerequisite is ECON 2106.

[3] Required prerequisite is MGT 2106, with a grade of C or higher.

- All courses counting toward the minor must be taken on a letter-grade basis and must be completed with a grade of C (2.00) or better.
- A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or Undergraduate Research. Students may not use 6 credit hours of either Special Problems or Undergraduate Research for a minor.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in Sustainable Cities

Planning for cities and urban regions brings together concepts that involve almost every major at Georgia Tech. From climate to the economy, from health to social justice, and from infrastructure to technology, a holistic, sustainable approach is needed to solve the complex problems facing cities and regions.

The School of City and Regional Planning offers a minor in Sustainable Cities that emphasizes sustainability in the context of the urban and regional built environment. It provides students with a deep learning experience that incorporates classroom learning and practical knowledge of the ways in which cities and regions can grow and thrive as they become more sustainable, just, and resilient.

Program of study

The minor includes (1) three credits of required coursework, (2) one additional three-credit course from a list of key-content courses, (3) one additional three-credit elective from a list of courses offered by the School of City and Regional Planning, (4) one additional 3-credit elective selected from a list of courses offered in related academic disciplines, and (5) one additional 3-credit elective drawn from the courses on any of the lists.

Code	Title	Credit Hours
Required Courses		
CP 2233	Sustainable Urban Development	3
Select three hours from the following of key-content courses:		3
CP 4020	Introduction to Urban and Regional Planning	
CP 4052	Sustainable Cities Studio	
CP 4510	Fundamentals of Geographic Information Systems	
CP 4813	Special Topics (World Citiies)	
Select three hours from the following list of City Planning courses:		3
CP 4010	Foundations of Urban and Regional Development	
CP 4020	Introduction to Urban and Regional Planning	
CP 4052	Sustainable Cities Studio	
CP 4105	Land Conservation	
CP 4190	Introduction to Climate Change Planning	
CP 4210	Environmental Planning and Impact Assessment	
CP 4310	Urban Transportation and Planning	
CP 4510	Fundamentals of Geographic Information Systems	
CP 6112	Introduction to Land Use Planning	
CP 6223	Policy Tools for Environmental Management	
CP 6442	Equity, Social Justice, and Economic Development	
CP 6612	Community Development	
CP 6630	Government and Housing Markets	
CP 6680	Citizen Participation and Community Engagement	
Select three hours from the following list of courses in related academic disciplines: [1]		3
SLS 3120	Foundations of Sustainable Systems	
SLS 3110	Technology and Sustainable Community Development	
MGT 4803	Special Topics in Industrial Management (Business Decisions for Shared Value)	
MGT 4803	Special Topics in Industrial Management (Social Impact: In-depth Exploration and Design)	
BIOS 2300	Ecology	
BIOS 2301	Ecology Laboratory	
EAS 4803	Special Topics (Extreme Atlanta: Climate Change in Urban Spaces)	
PUBP 3315	Environmental Policy and Politics	
PUBP 3350	Energy Policy	
PUBP 3320	Climate Policy	
PUBP 3600	Sustainability, Technology, and Policy	
HTS 2803	Special Topics (Semester in the City)	
HTS 3012	Urban Sociology	
HTS 3011	The City in American History	
HTS 3005	American Environmental History	
LMC 2350	Introduction to Social Justice	
LMC 3308	Environmentalism and Ecocriticism	
CS/INTA 4745	Information and Communication Technologies and Global Development	
CS/INTA 6745	Information and Communication Technologies and Global Development	
CEE 4610	Multimodal Transportation Planning, Design, and Operations	
CEE 4803	Special Topics (Smart and Sustainable Cities)	
ISYE 4501	Energy, Efficiency, and Sustainability	
ARCH 4151	History of Urban Form	
ARCH 4227	Architecture and Ecology	
INTA 2050	Intro to Global Development	
INTA 3232	Sustainable Megaregion	
INTA 3040	Energy, Environment, and Policy	
INTA 4744	Global Development Capstone	
Modern Languages courses [2]		
VIP courses [3]		
Study Abroad options [4]		
Select three hours from any of the above lists		3
Total Credit Hours		**15**

[1] The lists of courses shown above are not exhaustive. With permission of the Chair of the School of City and Regional Planning students may substitute one course with substantial Sustainable Cities content that is not on the above lists. All courses previously approved by the Chair will be included on an updated list of Chair Approved Courses available from the website of the School of City and Regional Planning.

[2] See list of approved Modern Languages courses posted on the School of City and Regional Planning minor website.

[3] VIP 2601, VIP 3601, VIP 3602, VIP 4601, VIP 4602, VIP 4603, VIP 4983-VV4 Bee Snap
VIP 2601, VIP 3601, VIP 3602, VIP 4601, VIP 4602, VIP 4603, VIP 4983-VV5 Engineering for Social Innovation
VIP 2601, VIP 3601, VIP 3602, VIP 4601, VIP 4602, VIP 4603, VIP 4983-VVS HumaniTech

[4] Study Abroad in Japan: Summer Program in Sustainable Development or Study Abroad in Italy: Sustainable Development & Climate Change (courses may also be taken on campus in Atlanta)

- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- All courses counting toward the minor must be taken on a letter-grade basis and must be completed with a grade of C (2.00) or better.
- It is the responsibility of the student and major advisor to verify that any courses a student wishes to count toward both a major and a minor meet all the Georgia Tech and major School requirements. For Georgia Tech minor requirements see the Catalog entry describing requirements for any minor (http://www.catalog.gatech.edu/academics/minors/).

Minor in Sustainable Development and Construction

Program of Study

Code	Title	Credit Hours
BC 2631	Introduction to Construction Science and Management	2
BC 2634	Construction Plans and Estimates	3
BC 3620	Real Estate and Construction Finance and Accounting	3
BC 3630	Project Management I	3
BC 4735	Real Estate Development and Construction	3
Electives		**3**
BC 2636	Construction Safety	
BC 3600	Construction Cost Management	
BC 3610	Construction Law	
BC 4050	Building Information Modeling for Multi-disciplinary Integration	
BC 4110	Trends & Pol For Res Dev	
BC 4130	Intg Design Constr & Dev	
BC 4270/6270	Sustainable Community Design and Construction	
BC 4600	Project Management II	
BC 4610	Value Engineering and Building Economics	
BC 4660	Entrepreneurship in Construction	
BC 4672	Mechanical, Electrical and Plumbing Systems for Construction Managers	
BC 4710	Green Construction	
BC 6675	Residential Design and Construction	
Total Credit Hours		**17**

- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- All courses counting toward the minor must be taken on a letter-grade basis and must be completed with a grade of C (2.00) or better.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Minor in Technology and Business

The Scheller College of Business, the College of Design, the College of Sciences, and the Ivan Allen College of Liberal Arts offer the competitive-admission technology & business minor through the Denning Technology & Management (T&M) Program. It is a course of study that enables undergraduate students from these colleges to learn one another's language through innovative coursework and interdisciplinary team projects focused on solving real-world problems presented by T&M's corporate affiliates.

The minor in technology & business curriculum requires completing 22 semester credit hours after being accepted to the T&M Program. T&M accepts applications in October.

Admission information is available at: https://www.scheller.gatech.edu/centers-and-initiatives/steven-a-denning-tech-and-management-program/admissions.html

Course requirements are available at: https://www.scheller.gatech.edu/centers-and-initiatives/steven-a-denning-tech-and-management-program/curriculum.html

Program of Study

Code	Title	Credit Hours
MGT 3743	Analysis of Emerging Technologies	3
MGT 3744	Managing Product, Service & Technology Development	3
MGT 4741	Integrative Management Development-Project Preparation	3
MGT 4742	Integrated Technology and Management Capstone Project	4
MGT 3300	Marketing Management I	3
MGT 3000	Financial and Managerial Accounting	3
MGT 3078	Finance and Investments	3
or MGT 3062	Financial Management	

- A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or Undergraduate Research. Students may not use 6 credit hours of either Special Problems or Undergraduate Research for a minor.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more

than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

GPA Requirement

The minimum, cumulative GPA required for applicants to the Denning T&M Program is 3.0 based on a minimum of 12 hours earned at Georgia Tech. In order for accepted students to maintain their eligibility to remain in the T&M Program, they must maintain a minimum 3.0 GPA for the classes required by the Denning T&M curriculum. All courses used to satisfy the requirements of the minor must be taken for a letter grade and must be completed with the grade of C (2.00) or better. All 22 credit hours are required.

Application and course descriptions are available at: http://scheller.gatech.edu/centers-initiatives/technology-management-program/index.html

Minor in Women, Science, and Technology

The Women, Science, and Technology (WST) program does what no other gender studies program does: it links science and technology issues to those issues more traditionally associated with women's studies. The WST minor prepares Tech students (women and men majoring in engineering, science, social sciences, and humanities) to live and work in an increasingly diverse world. The minor helps students develop their understanding of the human side of science and engineering involving not only gender issues, but inequalities of race and class as well.

WST courses reflect on the theoretical and practical dimensions of diversity. Students are encouraged to explore the values associated with scientific culture and to learn to synthesize knowledge across the disciplines, while viewing science and engineering as social and cultural forces that shape relations among women and men.

With permission of the WST coordinators, students may substitute one independent study course or course from another Georgia Tech unit. This may be chosen from special topics courses, seminars, and other courses that focus upon gender and social inequality or social issues of science and technology. Students may register and plan their courses of study for the WST minor by meeting with WST coordinators, Carol Colatrella (LMC) or Mary Frank Fox (PUBP). Students petition for the minor at the time they petition for their major degree. Minors are conferred upon graduation and appear on students' transcripts.

Women, Science, and Tech Information

Program of Study

The WST minor must be comprised of at least 15 credit hours. At least 12 of the minor's 15 credit hours must be upper-division coursework (numbered 3000 or above).

Code	Title	Credit Hours
Required Courses		
Select two courses from two different schools from the following:		6
LMC 3304	Science, Technology, and Gender	
HTS 3020	Gender and Technology	
HTS 3021	Women in Science and Engineering	
PUBP 4212	Women and Public Policy	
PUBP 4214	Gender, Science, Technology, and Public Policy	
Electives		
Select three courses from at least two different Ivan Allen College schools below OR from the Required Courses above: [1]		9
History and Sociology		
Literature, Media, and Communication		
Public Policy		
International Affairs		
Modern Languages		
Economics		
Total Credit Hours		**15**

[1] Only one independent study course from another GT unit can substitute for one elective course.

History and Sociology

Code	Title	Credit Hours
HTS 2082	Technology and Science in the Industrial Age	3
HTS 2084	Technology and Society	3
HTS 3007	Sociology of Work, Industry, and Occupations	3
HTS 3008	Class, Power, and Social Inequality	3
HTS 3016	Women and Gender in the United States	3
HTS 3017	Sociology of Gender	3
HTS 3022	Gender and Sports	3
HTS 3051	Women and the Politics of Gender in the Middle East	3
HTS 3082	Sociology of Science	3
HTS 3083	Technology and the Shaping of American Society	3
HTS 3084	Culture and Technology	3
HTS 3086	Sociology of Medicine and Health	3

Literature, Media, and Communication

Code	Title	Credit Hours
LMC 2100	Introduction to Science, Technology and Culture	3
LMC 2200	Introduction to Gender Studies	3
LMC 3212	Women, Literature, and Culture	3
LMC 3219	Literature and Medicine	3
LMC 3225	Gender Studies in the Disciplines	3
LMC 3302	Science, Technology, and Ideology	3
LMC 3306	Science, Technology, and Race	3
LMC 3308	Environmentalism and Ecocriticism	3
LMC 3316	Science, Technology, and Postcolonialism	3
LMC 3318	Biomedicine and Culture	3

Public Policy

Code	Title	Credit Hours
PUBP 2012	Foundations of Public Policy	3
PUBP 4410	Science, Technology, and Public Policy	3
PUBP 4416	Critical Issues in Science and Technology	3
PUBP 4200	Social Policy Issues	3

International Affairs

Code	Title	Credit Hours
INTA 4803	Special Topics	3
INTA 8803	Special Topics	3

Modern Languages

Code	Title	Credit Hours
SPAN 3241	The Individual and the Family in Hispanic Literature	3
SPAN 3242	Society in Hispanic Literature	3

Economics

Code	Title	Credit Hours
ECON 2100	Economic Analysis and Policy Problems	3
ECON 2101	The Global Economy	3
ECON 2105	Principles of Macroeconomics	3
ECON 2106	Principles of Microeconomics	3

Students can receive credit for either ECON 2100 or ECON 2101, or for ECON 2105/ECON 2106. Students cannot receive credit for ECON 2100 and ECON 2101, or for ECON 2100 and ECON 2105/ECON 2106, or for ECON 2101 and ECON 2105/ECON 2106.

- A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or Undergraduate Research. Students may not use 6 credit hours of either Special Problems or Undergraduate Research for a minor.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- All courses counting toward the minor must be taken on a letter-grade basis.
- All courses used to satisfy the course requirements for a minor must be completed with a grade of C (2.00) or better.
- It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Undergraduate Embedded Certificate in Accounting

Accounting is the language of business, the scoreboard which measures operational success and failure. Used by managers within the firm, accounting provides the information necessary to make effective decisions in the international marketplace.

Some accounting courses will help you prepare for several qualifying examinations, such as: Certified Public Accountant (CPA), Certified Management Accountant (CMA), and Chartered Financial Analyst (CFA). Meet with your adviser if you plan on pursuing one of these exams to ensure you take the appropriate classes.

Program of Study for Business Majors

Students enrolled in the Scheller College of Business may receive a Certificate in Accounting by earning a **grade of C or higher** in **all four** accounting electives. The courses must be taken on a letter grade basis.

Code	Title	Credit Hours
Required Courses:		
ACCT 2101	Accounting I: Financial Accounting	3
ACCT 2102	Accounting II: Managerial Accounting	3
Select four (4) from the following:		12
MGT 4010	Business Taxation	
MGT 4015	Advanced Managerial Accounting	
MGT 4026	Financial Reporting and Analysis I	
MGT 4027	Financial Reporting and Analysis II	
MGT 4028	Financial Analysis and Reporting of Technology Firms	
MGT 4030	International Accounting	
MGT 4041	Auditing and Financial Control Systems	
MGT 4043	Advanced Financial Reporting	
MGT 4045	Seminar in Advanced Accounting	
MGT 4047	Ethics & Accounting	
MGT 4803	Data Analytics in Accounting	
MGT 4910	Special Problems [1]	
Total Credit Hours		**18**

[1] Only one (1) Special Problems course will be permitted to count for the certificate

Program of Study for Non-Business Majors

Non-Business Administration Majors

Option I: Same requirements as for students enrolled in the Scheller College of Business (see above)

Option II: Completion of a minimum of **six** accounting courses (see below) with a **grade of C or higher** in each. The courses must be taken on a letter grade basis.

Code	Title	Credit Hours
Required courses:		
MGT 3000	Financial and Managerial Accounting	3
MGT 4026	Financial Reporting and Analysis I	3

Select four (4) from the following:		12
MGT 4010	Business Taxation	
MGT 4015	Advanced Managerial Accounting	
MGT 4027	Financial Reporting and Analysis II	
MGT 4028	Financial Analysis and Reporting of Technology Firms	
MGT 4030	International Accounting	
MGT 4041	Auditing and Financial Control Systems	
MGT 4043	Advanced Financial Reporting	
MGT 4045	Seminar in Advanced Accounting	
MGT 4047	Ethics & Accounting	
MGT 4803	Data Analytics in Accounting	
MGT 4910	Special Problems [1]	

[1] Only one (1) Special Problems course will be permitted to count for the certificate

Undergraduate Embedded Certificate in African American Studies

Undergraduate Embedded Certificate in Architecture and Society

The Certificate in Architecture and Society will provide both Architecture majors and students majoring in other disciplines an opportunity to explore the technological and formal innovations of architecture and infrastructure within their socio-political and cultural contexts. They will learn not only about buildings' technical systems—and their material, structural, and climatic performance—but also about their formal order, siting, use, funding/patronage, relation to nature or the city, decoration, and multiple interpretive contexts (philosophical, political, religious, civic, literary, etc.)

This certificate is intended to deepen Architecture majors' knowledge of the historical traditions, theoretical formulations, and critical assessments of architecture by allowing them to cluster several of their elective courses in an intellectually coherent, focused way. For non-majors, it offers an opportunity to gain expertise and build confidence in the analysis of architecture by learning how to articulate, contextualize, and critique central architectural concepts of the past and present.

For more information and how to apply, click here.

Program of Study

Code	Title	Credit Hours
Required Courses		**6**
For Architecure majors:		
ARCH 4151	History of Urban Form	
ARCH 4803 or ARCH 4823	Theory of Architecture I or Theory of Architecture II	
For non-Architecture majors:		
ARCH 4151	History of Urban Form	
ARCH 2111 or ARCH 2112	History of Architecture I or History of Architecture II	
Electives		**6**
ARCH 4107	Introduction to Historic Preservation	
ARCH 4114	Medieval Architecture	
ARCH 4120	Atlanta Architecture	
ARCH 4137	Postwar Architecture and Urbanism in the U.S.: Design, Politics & History	
ARCH 4129	Form and Narrative: Cross Media Analysis	
ARCH 4133	Architecture and Discourse of the Everyday	
ARCH 4143	Museums: History, Theory, Design	
ARCH 4232	On Growth and Form	
ARCH 4316	Traditions of Architectural Practice	
ARCH 4335	The Social Practice of Architecture	
ARCH 4630	Architecture, Space and Culture	
COA 3114	Art and Architecture in Classical Greece	
COA 3115	Art and Architecture in Italy I	
COA 3116	Art and Architecture in Italy II	
Total Credit Hours		**12**

- All courses must be completed with a 'C' grade or higher
- Courses used to satisfy the certificate requirements may be used to fulfill free electives required by the Institute, as well as Architecture electives for Architecture majors.

Undergraduate Certificate in Asian Affairs

Undergraduate Embedded Certificate in Astrophysics

The School of Physics offers an undergraduate embedded certificate in Astrophysics.

For more information and how to apply, click here.

Program of Study

Code	Title	Credit Hours
Required		
PHYS 2021 or PHYS 20	The Solar System Stars, Galaxies, and the Universe	3
PHYS 3021	Nuclear Astrophysics and Stellar Evolution	3
Electives [1]		**6**
PHYS 4147	Relativity	
PHYS 4247	Cosmology	
PHYS 4261	Atomic Physics	
PHYS 4347	Fundamentals of Astrophysics (with Chair approval)	
PHYS 4801	Special Topics	
PHYS 4699	Undergraduate Research (with Chair approval)	
Total Credit Hours		**12**

[1] There are courses offered at Georgia State University that would satisfy certificate requirements: ASTO 3500 Fundamentals of Astronomy and Astrophysics and ASTRO 4000 Fundamentals of Astrophysics. Students should speak with an advisor and consult certificate requirements for transfer coursework.

Undergraduate Embedded Certificate in Business Analytics

The Undergraduate Business Analytics Certificate offered by Scheller College provides training in statistics, and in data analysis, management and visualization, as well as in applications of analytics techniques to different business areas.

The objective of the Undergraduate Business Analytics certificate is to prepare students to structure, transform and analyze data to gain insights that will improve business intelligence and managerial decision-making.

This certificate is available to all undergraduate students at Georgia Tech.

For more information about Scheller College of Business Certificates and how to apply, click here.

Program of Study

Code	Title	Credit Hours
Core Requirement		
MGT 4050	Business Analytics	3
Three (3) courses chosen from the following:		**9**
MGT 3310	Marketing Research: Qualitative Aspects	
MGT 3745	Business Programming	
MGT 4028	Financial Analysis and Reporting of Technology Firms	
MGT 4057	Business Process Analysis and Design	
MGT 4058	Database Management Systems	
MGT 4181	Business Forecasting	
MGT 4332	Database and CRM Strategy	
MGT 4367	Revenue Analytics	
MGT 4726	Privacy, Technology, Policy, and Law	
MGT 4803	Data Visualization	
MGT 4803	Pricing Strategy and Analytics	
MGT 4803	Understanding Markets with Data Science	
CS 4460	Introduction to Information Visualization	
Total Credit Hours		**12**

- Student must earn a grade of "C" or higher in all of the courses to qualify for the certificate.
- *Please check the course catalog while planning a schedule*. Many of these courses require prerequisites which will not be waived. However, there are several allowed *substitutions* for **MGT 2250** as a prerequisite for MGT 4181, including: BMED 2400, BIOL 4401, ECON 2250, ISyE 2028 *and* ISyE 2027, ISyE 3770, MATH 3215, MATH 3225, MATH 3770 *or* MATH 3670, PSYC 2020, and PUPB 3120 (was PUBP 4113). For MGT 2251 as a prerequisite for MGT 4367, ISyE 4133 is an allowed substitution.

Undergraduate Embedded Certificate in Business Law and Ethics

The Scheller College of Business offers an undergraduate certificate in Business Law and Ethics. This certificate is only available to BS in Business Administration students.

Legal and ethical considerations create risks for businesses, and these risks must be avoided, minimized or managed. A practical understanding of law and ethics has thus become a critical element in business decision-making and strategy. Businesses cannot rely exclusively on outside counsel or in-house legal staff to manage all risks. Managers need an understanding of the legal and ethical environments in which they operate.

For more information about Scheller College of Business certificates and how to apply, click here.

Program of Study

Code	Title	Credit Hours
Core Requirement		
MGT 3607	Business Ethics	3
Three (3) courses from the following:		**9**
MGT 3605	Principles of Commerical Law	
MGT 3606	International Business Law	
MGT 3608	Technology Law and Ethics	
MGT 3609	Legal Aspects of Real Estate	
MGT 3614	Law for Entrepreneurs	
MGT 3616	Corporate Governance	
MGT 4010	Business Taxation	
MGT 4725	Information Security Strategies and Policy	
MGT 4726	Privacy, Technology, Policy, and Law	
MGT 4803	Business and Government Regulation	
MGT 4803	Employment, Benefits and Compensation Law	
MGT 4803	Foundations of Internet Policy and Governance	
MGT 4803	Legal Aspects of Managing Intellectual Property	
MGT 4803	Legal Issues in Sports Management	
Total Credit Hours		**12**

Undergraduate Embedded Certificate in Cellular and Molecular Biosciences

Biology majors are eligible to complete certificates within Biology electives and free electives.

All certificates are subject to the following requirements:

- Minimum 12 credits from the list of approved courses for each certificate
- Minimum 9 credits BIOS courework
- Minimum 9 credits of 3xxx or higher coursework
- Maximum 6 credits of Special Topics
- Maximum 3 credits Transfer Credit

- Courses may not be double-counted toward more than one certificate or minor

Students declare a certificate, select and complete at least 12 credits that correspond to the desired certificate from the list below. Complete Certificate Applications must be submitted at least two weeks prior to the end of your graduating semester. The Certificate Application will be available on the Biology Majors Portal site in Canvas.

Code	Title	Credit Hours
Select 12 credits (at least 9 credits must be Biological Sciences (BIOS):		12
BIOS 3380	Microbiology	
BIOS 3381	Microbiology Lab	
BIOS 4012	Protein Biology	
BIOS 4015	Cancer Biology and Biotechnology	
BIOS 4225	Molecular Evolution	
BIOS 4238	Ion Channels	
BIOS 4340	Medical Microbiology	
BIOS 4418	Microbial Physiology	
BIOS 4464	Developmental Biology	
BIOS 4500	Drug Discovery	
BIOS 4505	Programming in Biological and Life Sciences	
BIOS 4510	Epigenetics, Stem Cells, and Development	
BIOS 4530	Human Evolutionary Genomics	
BIOS 4545	Genetics of Complex Human Traits and Diseases	
BIOS 4550	Origin of complex life: from cells to societies	
BIOS 4560	RNA Biology and Biotechnology	
BIOS 4570	Immunology	
BIOS 4607	Molecular Biology of Microbes: Disease, Nature, and Biotechnology	
BIOS 4620	Aquatic Chemical Ecology	
BIOS 4744	Microbial Symbiosis & Microbiomes	
BIOS 4746	Signaling Molecules	
BIOS 4803	Special Topics (Chromosome Biology & Human Disease)	
BIOS 4803	Special Topics (Proteomics: Technology & Applications)	
CHEM 3511	Survey of Biochemistry	
CHEM 3521	Biochemistry I	
CHEM 3522	Biochemistry II	
NEUR 3001	Cell and Molecular Neuroscience	

Undergraduate Embedded Certificate in Chinese

The School of Modern Languages offers undergraduate embedded certificates in the following languages:

Chinese

French

German

Japanese

Russian

Spanish

Visit the School of Modern Languages for more information.

Undergraduate Embedded Certificate requirements:

Code	Title	Credit Hours
12 hours beyond CHIN 2001 [1,2,3,4,5]		12

1. Students may transfer a maximum of six (6) credit hours towards the certificate requirements with the approval of the Director of Undergraduate Studies.
2. Students may also apply a maximum of six (6) credit hours of special topics courses towards the certificate.
3. All courses counting toward a certificate must be taken on a letter grade basis, and a grade of C or better must be received in each course.
4. Additional requirements and information about undergraduate certificate programs can be found on the Certificate requirements page.
5. Students in their last semester before graduation should submit the Certificate Request form to have their certificate prepared for them.

Undergraduate Embedded Certificate in Computational Design

Students are required to successfully complete ARCH 2472 and ARCH 2474 and then may select 12 hours from the following list to complete the certificate.

Code	Title	Credit Hours
Select 12 hours from the following courses:		12
ARCH 4803	Special Topics (Architectonics)	
ARCH 4505	Geometric Constructs	
ARCH 4507	Parametric Design	
ARCH 4508	Shape Grammars	
ARCH 4833	Special Topics: Architectural Technology (Parametric Modeling with BIM)	
ARCH 4701	Analog-Digital Design Computing	
ARCH 4702	Design Scripting	
ARCH 4803	Special Topics (Embodiment + Digital Realm)	

Undergraduate Embedded Certificate in Construction Management

Juniors and seniors from any Georgia Tech bachelor's program are eligible for the interdisciplinary, professional Construction Management certificate.

Students in this program are permitted to participate in Building Construction's annual Career Fair and related career and networking events, and increases your potential for internships in building construction-related positions. Students in this program may also

apply to the Master of Science in Building Construction and Facility Management degree in the School of Building Construction without a GRE.

For more information and how to apply, click here.

Program of Study

Code	Title	Credit Hours
Required		
BC 4130	Intg Design Constr & Dev	3
BC 4140	Construction Management Project	3
Electives [1]		**6**
BC 3600	Construction Cost Management	
or CEE 4100	Construction Planning, Estimating, and Scheduling	
BC 3610	Construction Law	
BC 3630	Project Management I	
BC 4050	Building Information Modeling for Multi-disciplinary Integration	
BC 4610	Value Engineering and Building Economics	
BC 4700	Construction Management	
BC 4710	Green Construction	
ARCH 2211	Construction Technology and Design Integration I	
CEE 4120	Construction Equipment and Methods	
CEE 4130	Construction Safety and Health	
Total Credit Hours		**12**

[1] Speak with advisor to select electives

Undergraduate Embedded Certificate in Ecology, Evolution, and Conservation Biology

Biology majors are eligible to complete certificates within Biology electives and free electives.

All certificates are subject to the following requirements:

- Minimum 12 credits from the list of approved courses for each certificate
- Minimum 9 credits BIOS courework
- Minimum 9 credits of 3xxx or higher coursework
- Maximum 6 credits of Special Topics
- Maximum 3 credits Transfer Credit
- Courses may not be double-counted toward more than one certificate or minor

Students declare a certificate, select and complete at least 12 credits that correspond to the desired certificate from the list below. Complete Certificate Applications must be submitted at least two weeks prior to the end of your graduating semester. The Certificate Application will be available on the Biology Majors Portal site in Canvas.

Code	Title	Credit Hours
Select 12 credits (at least 9 credits must be Biological Sciences (BIOS):		12
BIOS 3100	Ecology & Evolution: An Australian Perspective	
BIOS 3380	Microbiology	
BIOS 3381	Microbiology Lab	
BIOS 4221	Biological Oceanography	
BIOS 4225	Molecular Evolution	
BIOS 4340	Medical Microbiology	
BIOS 4410	Microbial Ecology	
BIOS 4417	Marine Ecology	
BIOS 4418	Microbial Physiology	
BIOS 4428	Population Dynamics	
BIOS 4471	Behavioral Biology	
BIOS 4510	Epigenetics, Stem Cells, and Development	
BIOS 4515	Community Ecology	
BIOS 4550	Origin of complex life: from cells to societies	
BIOS 4620	Aquatic Chemical Ecology	
BIOS 4746	Signaling Molecules	
BIOS 4803	Special Topics (Conservation Biology)	
BIOS 4813	Special Topics (Biodiversity on a Changing Planet)	
BIOS 4813	Special Topics (Biology of Terrestrial Vertebrates)	
EAS 4300	Introduction to Physical and Chemical Oceanography	
EAS 4305	Physical and Chemical Oceanography	
EAS 4350	Paleoclimatology and Paleoceanography	
EAS 4410	Climate and Global Change	
EAS 4420	Environmental Field Methods	
EAS 4602	Biogeochemical Cycles	

Undergraduate Embedded Certificate in Economics

The certificate requires a minimum of 12 hours in Economics courses with at least nine (9) hours of 3000-level or higher ECON courses. All courses counting toward certificate must be taken on a letter-grade basis and must be completed with a grade of 'C' or higher. Courses required by name and number by major School may not be used toward certificate.

Code	Title	Credit Hours
Some 3000/4000-level ECON courses which may be considered to be used toward certificate		
ECON 3110	Advanced Microeconomic Analysis	3
ECON 3120	Advanced Macroeconomic Analysis	3
ECON 3150	Economic and Financial Modeling	3
ECON 3161	Econometric Analysis	3
ECON 4160	Economic Forecasting	3
ECON 4311	Strategic Economics for Global Enterprise	3
ECON 4340	Economics of Industrial Competition	3
ECON 4350	International Economics	3
ECON 4355	Global Financial Economics	3
ECON 4360	Network Economics	3
ECON 4421	Urban and Regional Economics	3
ECON 4411	Economic Development	3

ECON 4450	Topics in African American Entrepreneurship	3
ECON 4510	Economics of Health and Health Care	3
Other courses may be approved by Assistant Director of Academic Programs		

Code	Title	Credit Hours
Some 2000-level courses which may be considered to be used toward certificate (no more than 3 hours)		
ECON 2100	Economic Analysis and Policy Problems	3
ECON 2101	The Global Economy	3
ECON 2106	Principles of Microeconomics	3
ECON 2105	Principles of Macroeconomics	3

Undergraduate Embedded Certificate in Entrepreneurship

The Entrepreneurship Certificate combines courses in several of the functional areas of business to create in-depth knowledge of entrepreneurship, whether within a start up or in a large organization (intrapreneurship). The certificate is available to both business administration and all other majors at Georgia Tech.

The certificate covers knowledge and skills surrounding the entrepreneurial process including opportunity recognition, concept development, business plans, resource acquisition, and value creation.

For more information about Scheller College of Business certificates and how to apply, click here.

Program of Study

Code	Title	Credit Hours
Requirements for Business Administration majors		
Complete 1 (one) of the following:		**3**
MGT 4194	Social Enterprise and Entrepreneurship [1]	
MGT 4670	Entrepreneurship	
MGT 4803	Special Topics in Industrial Management (Business Fundamentals for Social Entrepreneurship) [1]	
Three (3) electives chosen from the following:		**9**
MGT 3075	Security Valuation	
MGT 3103	Leadership in a Changing Environment	
MGT 3325	Product Planning	
MGT 3510	Management of Technology	
MGT 3607	Business Ethics	
MGT 3608	Technology Law and Ethics	
MGT 3614	Law for Entrepreneurs	
MGT 3663	Technology Strategy	
MGT 3743	Analysis of Emerging Technologies	
MGT 3744	Managing Product, Service & Technology Development	
MGT 4056	Electronic Commerce	
MGT 4072	Entrepreneurial Finance	
MGT 4117	Global Workforce Management	
MGT 4191	The Entrepreneurship Forum	
MGT 4192	Impact Speaker Series Forum	
MGT 4193	Servant Leadership, Values & Systems	
MGT 4194	Social Enterprise and Entrepreneurship [1]	
MGT 4308	Advertising & Promotion: Integrated Marketing Communications	
MGT 4311	Digital Marketing	
MGT 4353	Operations Strategy	
MGT 4611	Integrative Management Analysis	
MGT 4803	Special Topics in Industrial Management (Integrative Management Analysis)	
MGT 4803	Special Topics in Industrial Management (Innovation & Entrepreneurial Behavior)	
MGT 4803	Special Topics in Industrial Management (Social Impact: In-depth Exploration and Design)	
MGT 4803	Special Topics in Industrial Management (Strategic Entrepreneurship)	
Total Credit Hours		**12**

[1] No credit allowed for both MGT 4194 and MGT 4803 (with title Business Fundamentals for Social Entrepreneurship).

Code	Title	Credit Hours
Requirements for non-Business majors:		
MGT 3000	Financial and Managerial Accounting [1]	3
MGT 3150	Principles of Management	3
or MGT 3103	Organizational Behavior	
MGT 4670	Entrepreneurship	3
Select 1 (one) from the following:		3
MGT 3075	Security Valuation	
MGT 3103	Leadership in a Changing Environment	
MGT 3325	Product Planning	
MGT 3510	Management of Technology	
MGT 3607	Business Ethics	
MGT 3608	Technology Law and Ethics	
MGT 3614	Law for Entrepreneurs	
MGT 3663	Technology Strategy	
MGT 3743	Analysis of Emerging Technologies	
MGT 3744	Managing Product, Service & Technology Development	
MGT 4056	Electronic Commerce	
MGT 4072	Entrepreneurial Finance	
MGT 4117	Global Workforce Management	
MGT 4191	The Entrepreneurship Forum	
MGT 4192	Impact Speaker Series Forum	
MGT 4193	Servant Leadership, Values & Systems	
MGT 4194	Social Enterprise and Entrepreneurship [2]	
MGT 4308	Advertising & Promotion: Integrated Marketing Communications	
MGT 4311	Digital Marketing	
MGT 4353	Operations Strategy	

MGT 4803	Special Topics in Industrial Management (Business Fundamentals for Social Entrepreneurship)
MGT 4803	Special Topics in Industrial Management (Innovation and Entrepreneurial Behavior)
MGT 4803	Special Topics in Industrial Management (Social Impact: In-depth Exploration and Design)
MGT 4803	Special Topics in Industrial Management (Strategic Entrepreneurship)
Total Credit Hours	**12**

[1] Students may also take ACCT 2101, but MGT 3000 is preferred.
[2] No credit allowed for both MGT 4194 and MGT 4803 (with title Business Fundamentals for Social Entrepreneurship).

- The content of the certificate program is composed of 12 semester hours.
- Students are required to earn a grade of "C" or higher in all certificate courses.
- All courses must be taken for a letter grade and not as pass/fail.
- Students enrolled in classes at Georgia Tech Lorraine may request approval to substitute the International Marketing course for MGT 3300 (Marketing Management).
- ***Note: Many of these courses require pre-requisites. Please check OSCAR before you register. Pre-requisites will not be waived.***

Undergraduate Embedded Certificate in European Affairs

The certificate in European Affairs, offered jointly by the School of History and Sociology and the Sam Nunn School of International Affairs, recognizes the achievement of concentrated knowledge in a subject area. Europe is intrinsically interesting and worthy of study. Its peoples, cultures, and histories contain a microcosm of the human experience. No matter your course of study at Georgia Tech, it will be enriched by the contemplation of the European experience. Industry, government, and non-governmental organizations need university graduates with informed perspectives on Europe. This certificate allows students to choose courses on such topics as ancient or recent European history, in-depth studies of modern European countries, and foreign policy through international affairs. Some courses used to meet certificate requirements may also be used to satisfy Area E (Social Science) requirements. Check the Core Area E page for eligibility.

For more information and how to apply, click here.

Program of Study

Code	Title	Credit Hours
Required (select one):		**3**
INTA 2220	Government and Politics of Western Europe	
INTA 2221	Politics of the European Union	
INTA 4230	Seminar in Europe: European Union	
Elective courses (select three):		**9**
HTS 1031	Europe Since the Renaissance	
HTS 2036	Revolutionary Europe: 1789-1914	
HTS 2037	Twentieth Century Europe: 1914 to Present	
HTS 3028	Ancient Greece: Gods, Heroes, and RuinS	
HTS 3029	Ancient Rome: From Greatness to Ruins	
HTS 3030	Medieval Europe: 350 to 1400	
HTS 3031	European Labor History	
HTS 3032	Modern European Intellectual History	
HTS 3033	Medieval England	
HTS 3035	Britain from 1815-1914	
HTS 3036	Britain Since 1914	
HTS 3038	The French Revolution	
HTS 3039	Modern France	
HTS 3041	Modern Spain	
HTS 3043	Modern Germany	
HTS 3045	Nazi Germany and the Holocaust	
HTS 3046	Science, Polilitcs, and Culture in Nazi Germany	
HTS 3048	Modern Russian History and Society	
HTS 3063	Outposts of Empire: Comparative History of British	
HTS 3803	Special Topics (with approval)	
HTS 3823	Special Topics (with approval)	
HTS 4031	Seminar in European History	
HTS 4699	Undergraduate Research (with approval)	
HTS 4813	Special Topics (with approval)	
HTS 4823	Special Topics (with approval)	
HTS 4833	Special Topics (with approval)	
HTS 4843	Special Topics (with approval)	
HTS 4925	Special Problems in History, Technology, and Society (with approval)	
HTS 4926	Special Problems in History, Technology, and Society (with approval)	
HTS 4927	Special Problems in History, Technology, and Society (with approval)	
HTS 4928	Special Problems in History, Technology, and Society (with approval)	
HTS 4929	Special Problems in History, Technology, and Society (with approval)	
INTA 2803	The EU as a Global Actor	
INTA 3120	European Security Issues	
INTA 3044	Global Politics of Technology	
INTA 3101	International Institutions	
INTA 3121	Foreign Policies of Russia and Eurasia	
INTA 3223	Transatlantic Relations	
INTA 3321	Political Economy of European Integration	
INTA 4121	Seminar in Europe: European Security	
INTA 4500	Pro-Seminar in International Affairs	
INTA 4803	Special Topics (with approval)	

- Twelve hours of courses, approved by the advisor. Nine of the twelve hours must normally be at the 3000-level or above.
- All courses must be taken on a letter-grade basis, and a grade of C or better must be received in each course.
- Courses required for majors or applied to other certificates or minors may not count toward the certificate.
- No more than three credit hours of special topics and three credit hours of special problems may be used towards the certificate.

Undergraduate Embedded Certificate in Finance

Technology is the market's present and future.The globalization of financial markets is influencing the financial services industry as well as corporate finance functions in a fundamental way, posing challenges for academics and practitioners alike. A fundamental understanding of these developments is necessary to succeed in the increasingly competitive global economy.

Program of Study for Business Majors

The Scheller College of Business offers a Certificate in Finance for undergraduate business administration and non-business administration students at Georgia Tech. **A grade of "C" or higher must be earned** in order for students to be eligible for the finance certificate.

Code	Title	Credit Hours
Required courses:		
MGT 3062	Financial Management	3
MGT 3076	Investments	3
Select three (3) from the following:		9
MGT 3075	Security Valuation	
MGT 3079	Management of Financial Institutions	
MGT 3082	Fundamentals of Real Estate Development	
MGT 3084	Derivative Securities	
MGT 4066	Corporate Restructuring	
MGT 4067	Financial Markets: Trading and Structure	
MGT 4068	Fixed Income	
MGT 4070	International Finance	
MGT 4071	Multinational Financial Management	
MGT 4072	Entrepreneurial Finance	
MGT 4803	Financial Modeling	
MGT 4803	Financial Aspects of Commercial Real Estate	
Total Credit Hours		**15**

Program of Study for Non-Business Majors

The Scheller College of Business offers a Certificate in Finance for undergraduate business administration and non-business administration students at Georgia Tech. **A grade of "C" or higher must be earned** in order for students to be eligible for the finance certificate.

Code	Title	Credit Hours
Required course:		
MGT 3078	Finance and Investments	3
Select three (3) from the following:		9
MGT 3075	Security Valuation	
MGT 3079	Management of Financial Institutions	
MGT 3082	Fundamentals of Real Estate Development	
MGT 3084	Derivative Securities	
MGT 4066	Corporate Restructuring	
MGT 4067	Financial Markets: Trading and Structure	
MGT 4068	Fixed Income	
MGT 4070	International Finance	
MGT 4071	Multinational Financial Management	
MGT 4072	Entrepreneurial Finance	
MGT 4803	Financial Modeling	
Total Credit Hours		**12**

Undergraduate Embedded Certificate in French

Undergraduate Embedded Certificate requirements:

Code	Title	Credit Hours
12 hours beyond FREN 2001 [1,2,3,4,5]		12

1. Students may transfer a maximum of six (6) credit hours towards the certificate requirements with the approval of the Director of Undergraduate Studies.
2. Students may also apply a maximum of six (6) credit hours of special topics courses towards the certificate.
3. All courses counting toward a certificate must be taken for letter grade basis, and a grade of C or better must be received in each course.
4. Additional requirements and information about undergraduate certificate programs can be found on the Certificate requirements page.
5. Students in their last semester before graduation should submit the Certificate Request form to have their certificate prepared for them.

Undergraduate Embedded Certificate in Genetics, Genomics, and Bioinformatics

Biology majors are eligible to complete certificates within Biology electives and free electives.

All certificates are subject to the following requirements:

- Minimum 12 credits from the list of approved courses for each certificate
- Minimum 9 credits BIOS courework
- Minimum 9 credits of 3xxx or higher coursework
- Maximum 6 credits of Special Topics
- Maximum 3 credits Transfer Credit
- Courses may not be double-counted toward more than one certificate or minor

Students declare a certificate, select and complete at least 12 credits that correspond to the desired certificate from the list below. Complete Certificate Applications must be submitted at least two weeks prior to the end of your graduating semester. The Certificate Application will be available on the Biology Majors Portal site in Canvas.

Code	Title	Credit Hours
Select 12 credits from the following: [1]		
BIOS 4015	Cancer Biology and Biotechnology	
BIOS 4150	Genomics and Applied Bioinformatics [2]	
BIOS 4505	Programming in Biological and Life Sciences	

BIOS 4510	Epigenetics, Stem Cells, and Development
BIOS 4530	Human Evolutionary Genomics
BIOS 4545	Genetics of Complex Human Traits and Diseases
BIOS 4560	RNA Biology and Biotechnology
BIOS 4607	Molecular Biology of Microbes: Disease, Nature, and Biotechnology
BIOS 4803	Special Topics (Proteomics: Technology & Applications)
BMED 4477	Biological Networks and Genomics
CS 1301	Introduction to Computing [3]
CS 1371	Computing for Engineers [3]
CS 4400	Introduction to Database Systems
CS 4710	Introduction to Computing Concepts for Bioinformatics

1 Students must select a minimum of 6 credits of BIOS courses. Non-BIOS courses from below may also be chosen. A maximum of 3 credits may be at the 1xxx or 2xxx level.

2 The course fulfilling the Quantitative Requirement cannot be applied to the Certificate; the QR may be fulfilled by BIOS 3400 or BIOS 4401 for BIOS 4150 to be applied to the certificate

3 The course fulfilling the Computer Science requirement cannot be applied to the Certificate; additional course(s) beyond the CS requirement may be taken toward the certificate

Undergraduate Embedded Certificate in German

The School of Modern Languages offers undergraduate embedded certificates in the following languages:

Chinese

French

German

Japanese

Russian

Spanish

Visit the School of Modern Languages for more information.

Undergraduate Embedded Certificate requirements:

Code	Title	Credit Hours
12 hours beyond GRMN 2001 [1,2,3,4,5]		12

1 Students may transfer a maximum of six (6) credit hours towards the certificate requirements with the approval of the Director of Undergraduate Studies.

2 Students may also apply a maximum of six (6) credit hours of special topics courses towards the certificate.

3 All courses counting toward a certificate must be taken on a letter grade basis, and a grade of C or better must be received in each course.

4 Additional requirements and information about undergraduate certificate programs can be found on the Certificate requirements page.

5 Students in their last semester before graduation should submit the Certificate Request form to have their certificate prepared for them.

Undergraduate Embedded Certificate in History

Undergraduate Embedded Certificate in Information Technology Management

The Information Technology Management (ITM) Certificate focuses on the design and development of computer-based business information systems and the role they play in organizations. It covers such topics as database design, systems analysis and design, data communications, and other concepts employed in the application of information technology to business activities.

This certificate is available to all undergraduate students at Georgia Tech.

For more information about Scheller College of Business certificates and how to apply, click here.

Program of Study

Code	Title	Credit Hours
Required courses:		
MGT 2210	Information Systems and Digital Transformation [4]	3
One (1) course in programming: [1,3,4]		3
CS 1301	Introduction to Computing	
CS 1331	Introduction to Object Oriented Programming	
CS 1371	Computing for Engineers	
CS 1372	Structured Program Design for Engineers	
MGT 3745	Business Programming	
One (1) course in database management: [2,3,4]		3
MGT 4058	Database Management Systems	
CS 4400	Introduction to Database Systems	
Two (2) courses from the following: [4]		6
MGT 3743	Analysis of Emerging Technologies	
MGT 4050	Business Analytics	
MGT 4052	Systems Analysis and Design	
MGT 4053	Business Data Communications	
MGT 4056	Electronic Commerce	
MGT 4057	Business Process Analysis and Design	
MGT 4450	Project Management	
Total Credit Hours		**15**

1 Only one (1) course from the list of programming courses may count toward the certificate unless student failed to earn a "C" or higher in a course already taken from the list.

2 Only one (1) course from the list of database courses may count toward the certificate unless student failed to earn a "C" or higher in a course already taken from the list.

[3] If student is prohibited by Institute, School, or departmental policy from "double counting" any course that may apply toward the ITM certificate, student must substitute courses from the list of ITM General Electives to satisfy the 5 course requirement for the certificate.

[4] All courses must be completed with a 'C' or higher.

Undergraduate Embedded Certificate in Intellectual Property

The School of Public Policy offers a Certificate in Intellectual Property (IP). This interdisciplinary certificate will be beneficial to students who are interested in

- careers as patent agents (computing, engineering, or science majors only), or
- law school to become intellectual property lawyers, or
- business who need to recognize the value of a company's intellectual property, or
- developing policy related to intellectual property and innovation.

In addition, the certificate will be helpful to anyone who simply wants to understand the laws and policies governing intellectual property.

While earning the certificate, students will have the opportunity to learn about the protections and the limits on those protections of intellectual property: including patents, copyrights, trademarks and other forms of intellectual property. Taking an interdisciplinary approach, the certificate in IP will teach students about law, business strategies, and public policies affecting intellectual property.

The IP Certificate Program generally follows Georgia Tech and School of Public Policy academic guidelines. To ensure eligibility for the certificate, students should discuss their planned course selection with the program director prior to registration.

For more information and how to apply, click here.

Program of Study

Code	Title	Credit Hours
Required course		
PUBP 4640	Technology Law, Policy, and Management	3
Three (3) courses from the following:		9
HTS 3085	Law, Technology, and Politics	
PUBP 3610	Pre-Law Seminar	
MGT 3663	Technology Strategy	
PUBP 4410	Science, Technology, and Public Policy	
PUBP 4650	Internet Law	
PUBP 4803	Advanced Science and Technology Policy	
PUBP 4833	Intellectual Property Transactions	
ME 2803	Patent Preparation and Process	
Total Credit Hours		**12**

- All courses must be taken for a letter grade and completed with a "C" or better.
- No more than 3 semester hours of Special Problems credit as designated by the program director may be applied toward the certificate.
- Courses required by name and number in a student's major degree program may not be applied toward the certificate.

Undergraduate Embedded Certificate in International Business

Undergraduate Embedded Certificate in Japanese

The School of Modern Languages offers undergraduate embedded certificates in the following languages:

Chinese

French

German

Japanese

Russian

Spanish

Visit the School of Modern Languages for more information.

Undergraduate Embedded Certificate requirements:

Code	Title	Credit Hours
12 hours beyond JAPN 2001 [1,2,3,4,5]		12

[1] Students may transfer a maximum of six (6) credit hours towards the certificate requirements with the approval of the Director of Undergraduate Studies.

[2] Students may also apply a maximum of six (6) credit hours of special topics courses towards the certificate.

[3] All courses counting toward a certificate must be taken on a letter grade basis, and a grade of C or better must be received in each course.

[4] Additional requirements and information about undergraduate certificate programs can be found on the Certificate requirements page.

[5] Students in their last semester before graduation should submit the Certificate Request form to have their certificate prepared for them.

Undergraduate Embedded Certificate in Latin American Affairs

The School of International Affairs offers an undergraduate embedded certificate in Latin American Affairs.

For more information and how to apply, click here.

Program of Study

Code	Title	Credit Hours
Select twelve credits from the following:		**12**
INTA 2050	Intro to Global Development	
INTA 2241	Government, Politics and Society of Latin America	

INTA 2803	Special Topics (with approval)	
INTA 3020	Contemporary Mexico	
INTA 3241	Latin American Politics	
INTA 3242	Soccer and Global Politics	
INTA 3243	US - Latin American Relations	
INTA 3303	Political Economy of Development	
INTA 4040	Environmental Politics	
INTA 4241	Democracy in the Global South	
INTA 4340	Latin American Regional Economic and Political Integration	
INTA 4803	Special Topics (with approval)	
INTA 4813	Special Topics (La actualidad latinoamericana:temas y perspectivas)	
INTA 4813	Special Topics (Revoluciones y revolucionarios de Mexico)	
ECON 4411	Economic Development	
HTS 3064	Sociology of Development	
SPAN 3235	Latin America Today	
Total Credit Hours		**12**

- Twelve hours of courses in Latin American affairs, approved by the advisor. Nine of the twelve hours must be at the 3000-level or above.
- At least two courses must be taken from INTA.
- All courses must be taken on a letter-grade basis, and a grade of C or better must be received in each course.
- Students majoring in INTA may not count courses towards the certificate that are required for their majors by name and number or for other INTA certificates.
- No more than six credits of special topics (4803) and three credits of special problems (4903) may be used towards the certificat

Undergraduate Embedded Certificate in Leadership and Organizational Change

This certificate will prepare the student to: plan, structure, mobilize, and transform the "people side" of organizations in order to maximize productivity and drive innovation.

The certificate focuses on: managing and leading individuals & teams; leadership across cultures; through analytics & modeling, optimization of human resource deployment, and leadership decision-making; leadership across business functions; management consulting; as well as formalizing the processes of innovation and organizational change.

This certificate is available to all undergraduate students at Georgia Tech.

For more information about Scheller College of Business certificates and how to apply, click here.

Program of Study

Code	Title	Credit Hours
Non-business major requirements		
Core Requirements		
MGT 3101	Organizational Behavior	3
MGT 3102	Managing Human Resources within a Regulatory Environment	3
Two (2) courses from the following:		**6**
MGT 3103	Leadership in a Changing Environment	
MGT 3118	Cross-cultural Management	
MGT 4119	Leading Teams in Organizations	
MGT 4193	Servant Leadership, Values & Systems	
MGT 4803	Innovation and Entrepreneurial Behavior	
Total Credit Hours		**12**

Code	Title	Credit Hours
Business major requirements		
Four (4) courses from the following:		**12**
MGT 3103	Leadership in a Changing Environment	
MGT 3118	Cross-cultural Management	
MGT 4102	Management Consulting	
MGT 4119	Leading Teams in Organizations	
MGT 4192	Impact Speaker Series Forum	
MGT 4193	Servant Leadership, Values & Systems	
MGT 4803	Innovation and Entrepreneurial Behavior	
Total Credit Hours		**12**

- All courses must be passed with a 'C' grade or higher to qualify for the Certificate.
- Note: Many of the courses require pre-requisites. Please check OSCAR before registering for courses. Pre-requisites will not be waived.

Undergraduate Embedded Certificate in Linguistics

The School of Modern Languages offers a separate **Certificate in Linguistics,** which consists of 12 credit hours.

For questions or further information about the Certificate in Linguistics, please contact the Linguistics advisor.

Program of Study

General Notes:

- All courses towards the Certificate must be taken for a letter grade, with a grade of C or better.
- At most two Special Topics courses (in any department) can count towards the Certificate.
- At least 9 of the 12 credits (3 courses) must be 3000-level or above.

Code	Title	Credit Hours
Required		
LING 2100	Introduction to Linguistics	3
Three (3) electives [1]		9
Total Credit Hours		**12**

[1] Electives may be chosen from:

- Any LING course
- Any foreign-language Modern Languages course (3000-level or above) substantially involving linguistics (for example, German/Japanese Applied Linguistics; French Phonetics; Spanish Sociolinguistics; Kaleidoscope of Chinese Languages; etc), with approval of the Program Coordinator. (Please note that some 3000-level foreign-language courses may require a placement test.)
- Any (at most one) Psychology course substantially involving language (for example, Human Language Processing; Introduction to Cognitive Science, etc) with approval of the Program Coordinator.
- Any (at most one) Computer Science course substantially involving language (for example, Natural Language Processing; Natural Language Understanding; etc) with approval of the Program Coordinator. (Please note that Computer Science courses may have pre-requisites.)
- Any (at most one) LING course taught at Emory, Georgia State, or any other accredited university, with approval of the Program Coordinator.

Undergraduate Embedded Certificate in Marketing

Marketing is the activity of business that is primarily responsible for developing the sales revenue of the firm. As such, marketing is concerned with developing new products and services and improving the existing offering to develop a steady and profitable sales stream. There are many supporting activities that have an impact on sales, including personal selling and promotion and developing good trade relationships for which marketing is responsible. The marketing of technology-based products is growing in importance along with international aspects of marketing, and these subjects are addressed.

Program of Study

The Scheller College of Business offers a Certificate in Marketing to both Business Administration and Non-business administration majors.

To qualify for the Marketing Certificate, students must earn at least a **"C"** in MGT 3300, and must earn a **"B" average** in MGT 3310 and the three electives.

Any elective course taught by Marketing faculty in the CoM will count toward the Marketing Certificate.

Up to 6 credit hours of special topics (MGT 4803) courses can count toward any one certificate. Credit for Special Topics (MGT 4803) instances of courses will not be awarded duplicate credit if permanent course listing is also completed.

Code	Title	Credit Hours
Required courses (Group A):		
MGT 3300	Marketing Management I [1]	3
MGT 3310	Marketing Research: Qualitative Aspects [2]	3
Select three (3) from the following (Group B): [2]		9
MGT 3325	Product Planning	
MGT 3312	Pricing Strategy and Analytics	
MGT 3313	Social Media Marketing	
MGT 4303	Personal Selling and Sales Management	
MGT 4304	Strategic Brand Management	
MGT 4305	Business-to-Business Marketing	
MGT 4307	Strategic Marketing	
MGT 4308	Advertising & Promotion: Integrated Marketing Communications	
MGT 4309	Services Marketing	
MGT 4311	Digital Marketing	
MGT 4331	Consumer Behavior	
MGT 4332	Database and CRM Strategy	
MGT 4335	International Marketing	
MGT 4345	Marketing Practicum	
MGT 4803	Advanced Topics in Marketing	
MGT 4803	Designing for Shared Value	
MGT 4803	Sales Marketing	
MGT 4803	Sustainable Marketing	
MGT 4803	Understanding Markets with Data Science	
MGT 4910	Special Problems	
Total Credit Hours		**15**

[1] Must complete with a 'C' grade or higher

[2] Must earn a 'B' average in MGT 3310 and three electives

Undergraduate Embedded Certificate in Microbial Systems

Biology majors are eligible to complete certificates within Biology electives and free electives.

All certificates are subject to the following requirements:

- Minimum 12 credits from the list of approved courses for each certificate
- Minimum 9 credits BIOS courework
- Minimum 9 credits of 3xxx or higher coursework
- Maximum 6 credits of Special Topics
- Maximum 3 credits Transfer Credit
- Courses may not be double-counted toward more than one certificate or minor

Students declare a certificate, select and complete at least 12 credits that correspond to the desired certificate from the list below. Complete Certificate Applications must be submitted at least two weeks prior to the end of your graduating semester. The Certificate Application will be available on the Biology Majors Portal site in Canvas.

Code	Title	Credit Hours
BIOS 3380	Microbiology	3
Select 9 hours from the following:		9
BIOS 4340	Medical Microbiology	
BIOS 4410	Microbial Ecology	
BIOS 4418	Microbial Physiology	
BIOS 4550	Origin of complex life: from cells to societies	
BIOS 4570	Immunology	
BIOS 4607	Molecular Biology of Microbes: Disease, Nature, and Biotechnology	
BIOS 4620	Aquatic Chemical Ecology	
BIOS 4744	Microbial Symbiosis & Microbiomes	
Labs (note labs are one-credit hour)		

BIOS 3381	Microbiology Lab	
Total Credit Hours		**12**

Undergraduate Embedded Certificate in Nuclear and Radiological Engineering

The Nuclear & Radiological Engineering program in the School of Mechanical Engineering offers a certificate in Nuclear & Radiological Engineering to non-NRE engineering students. This program provides a general knowledge of Nuclear and Radiological Engineering topics and is valuable for students whether or not students are going to graduate school or directly into the industry.

For more information and how to apply, click here.

Program of Study

Code	Title	Credit Hours
Required courses:		
NRE 2120	Elements of Nuclear and Radiological Engineering	3
Electives:		**9**
NRE 2110	Introduction to Nuclear and Radiological Engineering	
NRE 4206	Radiation Physics Laboratory	
NRE 4208	Nuclear Reactor Physics II	
NRE 4214	Reactor Engineering	
NRE 4232	Nuclear and Radiological Engineering Design	
NRE 4234	Nuclear Criticality Safety Engineering	
NRE 4266	Light Water Reactor Technology	
NRE 4328	Radiation Sources and Applications	
NRE 4404	Radiological Assessment and Waste Management	
NRE 4610	Introduction to Plasma Physics and Fusion Engineering	
Total Credit Hours		**12**

- All courses used toward the certificate must be completed with a grade of 'C' or higher.

Undergraduate Embedded Certificate in Operations and Supply Chain Management

The undergraduate student who completes the Operations and Supply Chain Management Certificate is considered to have a comprehensive knowledge of planning and managing an organization's resources and processes that create products or services. The resources include the work force, technology, supply chain, production and service creation processes, materials, and information, all of which typically represent a significant portion of an organization's total costs and controllable assets. The student is considered to have a depth of knowledge across a broad set of Operations Management issues that permeate all levels of decision making from the long-term strategic to the tactical and day-to-day activities. As a result, the student is capable of contributing to an organization's success by developing resource-based distinctive competencies.

Program of Study for Business Administration Majors

To earn the Operations and Supply Chain Management Undergraduate Certificate, students must complete the following requirements. All courses must be completed with a **grade of "C" or higher.**

Code	Title	Credit Hours
Required course:		
MGT 3501	Operations Management	3
Select four (4) from the following:		12
MGT 3510	Management of Technology	
MGT 3744	Managing Product, Service & Technology Development	
MGT 4341	Management of Healthcare Operations	
MGT 4352	Operations Resource Planning and Execution	
MGT 4353	Operations Strategy	
MGT 4360	Global Operations and Supply Chain Management	
MGT 4365	Quality Control and Improvement	
MGT 4366	Service Operations Management	
MGT 4367	Revenue Analytics	
MGT 4401	Supply Chain Modeling	
MGT 4803	Business Decisions for Sustainability & Shared Value	
MGT 4803	Managing Process Innovation	
Total Credit Hours		**15**

Program of Study for non-Business Administration Majors

The content of the certificate program is composed of **12 semester hours.** Students are required to earn a **grade of "C" or higher** in all certificate courses. All courses must be taken for a letter grade and not as pass/fail.

Code	Title	Credit Hours
Required course:		
MGT 3501	Operations Management	3
Select three (3) from the following:		9
MGT 3510	Management of Technology	
MGT 3744	Managing Product, Service & Technology Development	
MGT 4341	Management of Healthcare Operations	
MGT 4352	Operations Resource Planning and Execution	
MGT 4353	Operations Strategy	
MGT 4360	Global Operations and Supply Chain Management	
MGT 4365	Quality Control and Improvement	
MGT 4366	Service Operations Management	
MGT 4367	Revenue Analytics	
MGT 4401	Supply Chain Modeling	
MGT 4803	Business Decisions for Sustainability & Shared Value	

MGT 4803	Managing Process Innovation	
Total Credit Hours		**12**

Undergraduate Embedded Certificate in Philosophy

Studying philosophy improves your abilities to think and communicate, and to acquire a breadth of understanding about the world, science, society, and yourself that can inform your judgment and how you shape the world long after graduation.

For more information about the Certificate in Philosophy and how to apply, click here.

Program of Study

Code	Title	Credit Hours
Required course		**3**
Four (4) from the following:		**12**
PHIL 2010	Introduction to Philosophical Analysis	
PHIL 2025	Philosophical Analysis of Policy Choices	
INTA 2030	Ethics in International Affairs	
PHIL 3050	Political Philosophy	
PHIL 3102	Ancient Philosophy	
PHIL 3103	Modern Philosophy	
PHIL 3105	Ethical Theories	
PHIL 3109	Engineering Ethics	
PHIL 3113	Logic and Critical Thinking	
PHIL 3127	Science, Technology, and Human Values	
PHIL 4110	Theories of Knowledge	
PHIL 4752	Philosophical Issues in Computation	
PHIL 4174	Perspectives in Science and Technology	
PHIL 4176	Environmental Ethics	
PHIL 4803	Special Topics	
Total Credit Hours		**15**

- At least 3 of these courses must be taken at the 3000 level or higher.
- Courses counting toward the certificate must be taken on a letter grade basis; a grade of C or better must be achieved in each course.

Undergraduate Embedded Certificate in Physics of Living Systems

The School of Physics offers an undergraduate certificate in Physics of Living Systems.

Program of Study

Code	Title	Credit Hours
Select 12 hours from the following:		12
PHYS 3250	Principles of the Physics of Living Systems	
PHYS 4250	Neurophysics	
PHYS 4251	Biophysics	
PHYS 4699	Undergraduate Research [1]	
PHYS 4801	Special Topics [2]	
PHYS 4802	Special Topics [2]	
PHYS 4803	Special Topics [2]	
PHYS 4804	Special Topics [2]	
Total Credit Hours		**12**

1 Must have approval from faculty certificate administrator; A maximum of 4 hours of PHYS 4699 may be used towards certificate.

2 Must have approval from faculty certificate administrator; A maximum of 6 hours of Special Topics course hours may be applied towards certificate.

Undergraduate Embedded Certificate in Physiology and Biomedical Sciences

Biology majors are eligible to complete certificates within Biology electives and free electives.

All certificates are subject to the following requirements:

- Minimum 12 credits from the list of approved courses for each certificate
- Minimum 9 credits BIOS courework
- Minimum 9 credits of 3xxx or higher coursework
- Maximum 6 credits of Special Topics
- Maximum 3 credits Transfer Credit
- Courses may not be double-counted toward more than one certificate or minor

Students declare a certificate, select and complete at least 12 credits that correspond to the desired certificate from the list below. Complete Certificate Applications must be submitted at least two weeks prior to the end of your graduating semester. The Certificate Application will be available on the Biology Majors Portal site in Canvas.

Code	Title	Credit Hours
BIOS 3753	Human Anatomy	3
BIOS 3755	Human Physiology	3
Choose a minimum of 6 credits:		6
BIOS 3380	Microbiology	
BIOS 4015	Cancer Biology and Biotechnology	
BIOS 4100	Exercise Physiology	
BIOS 4200	Kinesiological Basis of Human Movement	
BIOS 4238	Ion Channels	
BIOS 4340	Medical Microbiology	
BIOS 4400	Human Neuroanatomy	
BIOS 4418	Microbial Physiology	
BIOS 4440	Human Pathology	
BIOS 4464	Developmental Biology	
BIOS 4500	Drug Discovery	
BIOS 4520	Health Genes Society	
BIOS 4540	Human Motor Control	
BIOS 4570	Immunology	
BIOS 4651	Bioethics	

	BIOS 4803	Special Topics (Chromosome Biology & Human Disease)
	BIOS 4803	Special Topics (Neuromotor Physiology)
	BIOS 4803	Special Topics (Integrative Physiology)
Labs (note labs are 1-credit hour)		
	BIOS 3381	Microbiology Lab
	BIOS 3754	Laboratory in Human Anatomy
	BIOS 3756	Physiology Laboratory
Total Credit Hours		**12**

Undergraduate Embedded Certificate in Political Science

The discipline of political science is within the Ivan Allen College of Liberal Arts, and the minor is offered by the School of Public Policy. Undergraduate courses in political science are intended to broaden students' perceptions of political processes and governmental institutions.

Certificate and minor programs in political science, administered by the School of Public Policy, are available for students who wish to concentrate coursework in this discipline.

For more information about the Certificate in Political Science and how to apply, click here.

Program of Study

The Certificate in Political Science requires POL 1101 (or equivalent) and twelve (12) semester credits in public policy of which at least nine (9) are 3000 or above, with a letter grade of C or better in each.

In all cases, students should have their program of study approved by the Political Science Minor/Certificate supervisor before enrolling in a course they intend to count toward the certificate. For a general guide of possible courses with which to develop a program, students should consult the catalog and recent Oscars.

Code	Title	Credit Hours
POL 1101	Government of the United States ((Or, equivalent))	3
Select 12 hours from the following: [1]		**12**
INTA 2210	Comparative Political Philosophies and Ideologies	
PHIL 3050	Political Philosophy	
POL 2101	State and Local Government	
PUBP 2012	Foundations of Public Policy	
PUBP 3000	American Constitutional Issues	
PUBP 3016	Judicial Process	
PUBP 3141	Leading Social Organizations	
PUBP 3201	Introduction to Social Policy	
PUBP 3214	African American Politics	
PUBP 4120	Survey Research Methods	
PUBP 4200	Social Policy Issues	
PUBP 4212	Women and Public Policy	
PUBP 4226	Business and Government	
PUBP 4410	Science, Technology, and Public Policy	
PUBP 4416	Critical Issues in Science and Technology	
PUBP 4514	Mass Communication Policy	

[1] Nine hours must be at least 3000/4000-level.

Institute and School Guidelines

The minor/certificate degrees follow Institute and School guidelines that include the following:

- No more than 6 semester hours of Special Topics courses may be included in a minor/certificate program. No more than 3 semester hours of pre-approved political science internship credit may be applied to the Political Science minor or certificate.
- Courses required by name and number and/or used to satisfy Core Areas A through E in a student's major degree program may not be used in satisfying the course requirements for a minor/certificate. Important: if a student is using a course to fulfill the social science requirement in the student's major, that course cannot be counted toward the Political Science minor/certificate. However, courses used in a minor/certificate also may be used to fulfill other elective requirements (free electives, technical electives, etc.) in the student's major degree program.
- A course may not be counted toward more than one minor and/or certificate.
- In some cases, students may be pre-approved to count one political science-related course taught in another school at Georgia Tech toward the Political Science minor/certificate.
- All courses counting toward the minor/certificate must be completed in residence at Georgia Tech, be taken on a letter-grade basis, and completed with an overall grade point average of at least 2.00.

Undergraduate Embedded Certificate in Pre-Law

The mission of the Pre-Law program is two-fold. The first aspect of our mission is to enable students to make an educated decision about whether to attend law school and embark on a career in law. Unlike most academic disciplines, law has no undergraduate major leading to a degree in the field. Accordingly, it can be difficult for a student majoring in any of our undergraduate programs to make an informed decision about becoming a lawyer. Students will have an idea about careers in their fields of study, or about graduate education in their fields, but students are unlikely to be in a position to make an informed decision about law practice or legal education. By the time a student completes the Law Science & Technology minor or the Pre-Law certificate, that student will be well positioned to decide on whether to become a lawyer. The program is designed to inform students who are interested in applying to law school and to inform students who want to understand elements of legal practice that are useful in other career choices.

The second aspect of our mission is to develop the skill set necessary for Georgia Tech students to excel in law school. This is different than the skill set emphasized in engineering or scientific majors. As law students, written communication skills are essential. Law students must learn to read large volumes of complex material, synthesize it with other material, and prepare a well-written analysis. To help develop these skills, many of our classes contain a significant writing component. While introducing students to the fundamentals of legal writing, we are necessarily practicing the fundamentals of good writing in general. This

training will position our students to be competitive with their peers in law school.

Program of Study

Code	Title	Credit Hours
Required course		
PUBP 3000	American Constitutional Issues	3
or PUBP 30	Judicial Process	
or PUBP 36	Pre-Law Seminar	
or PUBP 46	Legal Practice	
Electives [3]		**9**
CS 4010	Introduction to Computer Law	
CS 4280	Survey of Telecommunications and the Law	
CS/MGT/ PUBP 4725	Information Security Strategies and Policies	
CS/MGT/ PUBP 4726	Privacy, Technology, Policy, and Law	
CS 4803	Internet Law	
ECON 4301	Economics of Information, Transactions Costs, and Contracts	
ECON 4321	Economics of Technology, Innovation, and Entrepreneurship	
ECON 4370	Law and Economics	
HTS 3002	History of American Business	
HTS 3006	United States Labor History	
HTS 3085	Law, Technology, and Politics	
INTA 3031	Human Rights in a Technological World	
INTA 3301	International Political Economy [1]	
INTA 4060	International Law	
INTA 4803	International Law	
INTA 4803	International Human Rights	
INTA 4803	National Security Law	
INTA 4803	The Laws of War	
ME 4803	Engineering Law and Ethics	
ME 2803	Patent Preparation and Process	
MGT 2106	Legal, Social, Ethical Aspects of Business [2]	
MGT 3102	Managing Human Resources within a Regulatory Environment [2]	
MGT 3605	Principles of Commerical Law	
MGT 3606	International Business Law	
MGT 3608	Technology Law and Ethics	
MGT 3609	Legal Aspects of Real Estate	
MGT 3614	Law for Entrepreneurs	
MGT 4010	Business Taxation	
MGT 4803	Business and Government Regulation	
MGT 4803	Corporate Governance	
MGT 4803	Legal Issues in Sports Management	
PHIL 3113	Logic and Critical Thinking	
PHIL 4803/ PUBP 4803	Health Care Law, Policy, and Management/ Ethics	
PHIL 4803	Philosophical Analysis with Argument Mapping	
PUBP 3000	American Constitutional Issues	
PUBP 3016	Judicial Process	
PUBP 3610	Pre-Law Seminar	
PUBP 4111	Internet and Public Policy	
PUBP 4226	Business and Government	
PUBP 4440	Science, Technology, and Regulation	
PUBP 4609	Legal Practice	
PUBP 4620	Environmental Law	
PUBP 4640	Technology Law, Policy, and Management	
PUBP 4650	Internet Law	
PUBP 4652	OLA Legal Internship	
PUBP 4803	Biomedical Law, Policy, & Ethics	
PUBP 4803	Biotechnology Law & Policy	
PUBP 4803	Current Controversies	
PUBP 4803	Race, Gender, and the Fourteenth Amendment	
PUBP 4803	History of American Law	
PUBP 4803	Intellectual Property Transactions	
PUBP 4803	Law and Science	
PUBP 4803	Legal Internship	
PUBP 4803	Mock Trial	
PUBP 4803	Science, Philosophy, and the Law	
PUBP 4803	Transactional Law	
PUBP 4803	Survey of Telecommunications and the Law	
PUBP 4803	Sports Law and Public Policy	
PUBP 4801	Advanced Intellectual Property Law	
PUBP 4801	Legal Research and Writing	
PUBP 6330	Environmental Law	
Total Credit Hours		**12**

1 INTA majors MAY NOT count this course as an elective toward the Certificate or Minor because it is required by name and number for the INTA major. This is an Institute rule for Certificates and Minors.

2 Management majors MAY NOT count this course as an elective toward the Certificate or Minor because it is required by name and number for the Management major. This is an Institute rule for Certificates and Minors.

3 Special problems courses, as designated by the Director of the Law, Science & Technology Program on a case-by-case basis, may be counted towards the electives requirements for the Certificate and Minor.

- At least 9 hours must consist of upper-level coursework (courses numbered 3000 or above).
- Special topics courses set forth above may be counted toward the Pre-Law Certificate electives requirement. These courses may be 1-hour, 2-hour, 3-hour, or 4-hour courses. You may apply any combination of these courses toward satisfying the 9-hour Certificate electives requirement.
- Special problems courses, as designated by the Director of the Law, Science & Technology Program on a case-by-case basis, may be counted toward the Pre-Law Certificate electives requirement. These courses may be 1-hour, 2-hour, 3-hour, or 4- hour courses. You may apply any combination of these courses toward satisfying the Certificate electives requirement, but you may not count more than 4 hours of special problems courses toward this requirement.
- Courses specifically required by name and number in a student's major degree program may not be counted toward the Pre-Law Certificate.

- Courses applied to fulfill electives requirements for the student's major (free electives, technical electives, humanities electives, social science electives, etc.) may be counted toward the Certificate.
- No course applied to satisfy any requirement for the Pre-Law Certificate may be applied to satisfy any requirement for any other Certificate or Minor.
- All courses applied to satisfy any requirement for the Pre-Law Certificate must be taken in residence at Georgia Tech.

Undergraduate Embedded Certificate in Public Policy

The School of Public Policy offers an undergraduate embedded certificate in Public Policy.

For more information and how to apply, click here.

Program of Study

Code	Title	Credit Hours
POL 1101	Government of the United States (or, equivalent)	3
12 hours of Public Policy coursework [1]		**12**

[1] At least 9 hours must be 3000/4000-level

In all cases, students should have their program of study approved by the Public Policy Minor/Certificate supervisor before enrolling in a course they intend to count toward the certificate. A student may seek advance permission from the School of Public Policy to allow 3 hours of upper-division coursework taught outside the School to count toward the completion of the certificate if that coursework is clearly relevant to Public Policy.

Institute and School Guidelines

The minor/certificate degrees follow Institute and School guidelines that include the following:

- No more than 6 semester hours of Special Topics courses may be included in a minor/certificate program. No more than 3 semester hours of Public Policy Internship credit may be applied to the minor or certificate.
- Courses required by name and number and/or used to satisfy Core Areas A through E in a student's major degree program may not be used in satisfying the course requirements for a minor/certificate. Important: if a student is using a PUBP course to fulfill the social science requirement in the student's major, that course cannot be counted toward the Public Policy minor/certificate. However, courses used in a minor/certificate also may be used to fulfill other elective requirements (free electives, technical electives, etc.) in the student's major degree program.
- A course may not be counted toward more than one minor and/or certificate.
- All courses counting toward the minor/certificate must be completed in residence at Georgia Tech, be taken on a letter-grade basis, and completed with an overall grade point average of at least 2.00.

Undergraduate Embedded Certificate in Pulp and Paper

Our program develops future leaders of the paper and forest products industry. A student currently enrolled in the Schools of ChBE, ME, MSE, or Chem can obtain a certificate demonstrating their proficiency in pulp and paper science and engineering.

For more information and how to apply, click here.

Program of Study

Code	Title	Credit Hours
CHBE/ME 4720	Pulp and Paper Manufacturing	3
CHBE/ME 4730	Emerging Technologies for Forest Bioproducts	3
CHBE 4767	Pulp And Paper Lab	3
or ME 4767	Pulp and Paper Lab	
CHBE 4699	Undergraduate Research	3
or CHBE 49	Special Problems	
Total Credit Hours		**12**

- Courses must be taken on a letter-grade basis and a grade of "C" or better must be earned to count towards the certificate.
- These courses are cross-listed so that ME, MSE and Chem students can enroll and gain elective credit.

Undergraduate Embedded Certificate in Real Estate Development

The School of City and Regional Planning, with the cooperation of the School of Building Construction and the Scheller College of Business, offers a certificate in real estate development for undergraduates in good standing at Georgia Tech. The certificate is designed to provide specialized education in real estate development. The certificate makes our students more competitive in securing employment and in advancing to graduate education.

Students must complete twelve credit hours in required and restricted elective courses that must be taken from the College of Design or the Scheller College of Business. Students must maintain a minimum grade point average of 2.7. The certificate is awarded upon graduation or the next semester after graduation.

Program of Study

Code	Title	Credit Hours
MGT 3082	Fundamentals of Real Estate Development	3
Choose one from the following:		3
CP 4610	Introduction to Real Estate Investment	
BC 4735	Real Estate Development and Construction	
Choose two from the following:		6
CP 4610	Introduction to Real Estate Investment	
CP 6611	Principles of Real Estate Finance and Development	
CP 6640	Applied Real Estate Development Methods	
ARCH 4151	History of Urban Form	

BC 3620	Real Estate and Construction Finance and Accounting
BC 4640	Construction Marketing
BC 4735	Real Estate Development and Construction
BC 6185	Introduction to Construction Program Management
BC 6375	Trends & Pol For Res Dev
BC 6385	Management of Design Phase as Owner
BC 6500	Real Estate Asset and Income Property Management
BC 6575	Real Estate Production Finance
BC 6675	Residential Design and Construction
MGT 3075	Security Valuation
MGT 3078	Finance and Investments
MGT 3609	Legal Aspects of Real Estate
MGT 4068	Fixed Income
MGT 4803	Special Topics in Industrial Management (Real Estate Practicum)
Total Credit Hours	**12**

Undergraduate Embedded Certificate in Russian

The School of Modern Languages offers undergraduate embedded certificates in the following languages:

Chinese

French

German

Japanese

Russian

Spanish

Visit the School of Modern Languages for more information.

Undergraduate Embedded Certificate requirements:

Code	Title	Credit Hours
12 hours beyond RUSS 2001 [1,2,3,4,5]		12

1. Students may transfer a maximum of six (6) credit hours towards the certificate requirements with the approval of the Director of Undergraduate Studies.
2. Students may also apply a maximum of six (6) credit hours of special topics courses towards the certificate.
3. All courses counting toward a certificate must be taken on a letter grade basis, and a grade of C or better must be received in each course.
4. Additional requirements and information about undergraduate certificate programs can be found on the Certificate requirements page.
5. Students in their last semester before graduation should submit the Certificate Request form to have their certificate prepared for them.

Undergraduate Embedded Certificate in Scenarios, Models, and Military Games

The Certificate in Scenarios, Models, and Military Games will give students a grounding in the use of scenarios, models, and gaming in the analysis of national security issues. The initial courses provide a broad overview of the relationship between technology and military operations. An additional requirement consisting of a class in Geographic Information Systems (GIS) introduces the student to geographically distributed data and the usage of maps for spatial analysis. The subsequent courses build upon that and teach students to apply advanced computational and analytic methods to national security issues.

For more information and how to apply, click here.

Program of Study

Code	Title	Credit Hours
CP 4510	Fundamentals of Geographic Information Systems	3
INTA 4742	Modeling, Simulation, and Military Gaming	3
or CX 4232	Simulation and Military Gaming	
Select one of the following:		3
INTA 4011	Technology and Military Organization	
INTA 4016	Strategy and Arms Control	
INTA 4803	Special Topics (War in the 20th Century)	
Select one of the following:		3
INTA 4014	Scenario Writing and Pathgaming	
INTA 3111	U.S. Defense Policy	
Total Credit Hours		**12**

- Twelve hours of coursework in INTA and CP, as indicated below.
- Courses required by name and number and/or used to satisfy core areas A through E in a student's major degree program may not be used in satisfying the course requirements for a certificate.
- A course may not be counted toward more than one minor and/or certificate.
- All courses for the certificate must be taken on a letter-grade basis, and a grade of C or better is required in each course counted toward the certificate.
- No more than six credits of special topics (4803) and three credits of special problems (4903) may be used towards the certificate.
- To receive the Certificate in Scenarios, Models and Military Games, the student must complete all requirements for a bachelor's degree at Georgia Tech.

Undergraduate Embedded Certificate in Software Engineering

All coursework must be taken for letter grade and students must receive a grade of 'C' or higher to be eligible to be used toward the certificate.

Code	Title	Credit Hours
Required Courses		
CS 2335	Software Practicum	3
CS 3300	Introduction to Software Engineering	3
Electives		**6**
CS 4320	Introduction to Software Processes	
CS 4330	Software Engineering Applications	
CS 4400	Introduction to Database Systems	
CS 4560	Verification of Systems	
Total Credit Hours		**12**

Undergraduate Embedded Certificate in Spanish

The School of Modern Languages offers undergraduate embedded certificates in the following languages:

Chinese

French

German

Japanese

Russian

Spanish

Visit the School of Modern Languages for more information.

Undergraduate Embedded Certificate requirements:

Code	Title	Credit Hours
12 hours beyond SPAN 2001 [1,2,3,4,5]		12

1. Students may transfer a maximum of six (6) credit hours towards the certificate requirements with the approval of the Director of Undergraduate Studies.
2. Students may also apply a maximum of six (6) credit hours of special topics courses towards the certificate.
3. All courses counting toward a certificate must be taken on a letter grade basis, and a grade of C or better must be received in each course.
4. Additional requirements and information about undergraduate certificate programs can be found on the Certificate requirements page.
5. Students in their last semester before graduation should submit the Certificate Request form to have their certificate prepared for them.

Undergraduate Embedded Certificate in Special Studies in Biological Sciences

Biology undergraduates may propose their own customized certificate, subject to review by the Biology Undergraduate Committee. Students are encouraged to work with their Biology Academic Advisor in designing any customized certificate. The customized certificate must meet the following criteria to be considered by the committee:

- The courses used to complete the certificate must be centered around a biological theme and/or subdiscipline
- Students must propose an appropriate name for the certificate relevant to the theme, include justification for each proposed course in the certificate explaining how it relates to the theme, and why and how the proposed theme is sufficiently distinct from the above certificates
- Minimum 12 credits, including minimum 9 credits of BIOS coursework and maximum 3 credits of non-BIOS coursework fitting within the proposed certificate theme
- Minimum 9 credits of 3xxx or higher coursework
- Maximum 6 credits of Special Topics
- Maximum 3 credits Transfer Credit
- Courses may not be double-counted toward more than one certificate or minor

Undergraduate Embedded Certificate in Strategy and Innovation

Strategy and Innovation, as a practice, develops and integrates other functions – such as finance, marketing, and organizational behavior – to help us learn how firms gain and sustain competitive advantage. Strategy and Innovation focus on creating and capturing value for stakeholders with novel ideas, products, services, processes, and business models. While chief financial officers make financial decisions and chief marketing officers make marketing decisions, chief executive officers make decisions on corporate strategy and innovation.

For more information on Scheller College of Business certificates and how to apply, click here.

Program of Study

Code	Title	Credit Hours
Pre-requisites before completing minor:		
ACCT 2101	Accounting I: Financial Accounting	
or MGT 3	Financial and Managerial Accounting	
MGT 3659	Foundations of Strategy	
Required courses		
MGT 3664	Corporate Strategy	3
MGT 4196	Strategy Consulting Practicum	3
MGT 4220	Integrative Management Experience	3
Select one (1) course from the following:		**3**
MGT 3661	Advanced Concepts in International Business	
MGT 3663	Technology Strategy	
MGT 4803	Behavioral Economics	
MGT 4803	Global Strategy	
MGT 4803	IP Strategy	
MGT 4803	Managerial Economics and Strategic Behavior	
MGT 4803	Strategic Entrepreneurship	
Total Credit Hours		**12**

- All courses must be completed with a 'C' or higher.
- Note that some courses require pre-requisites which students will be required to take. No course waivers will be offered.

Undergraduate Embedded Certificate in Sustainable Architecture

The Certificate in Sustainable Architecture provides undergraduate students who major in Architecture the opportunity to specialize in design and technical innovations that will increase building energy performance, reduce emissions, use eco-friendly materials, and thereby increase the durable societal value of the built environment. The design and retrofit of energy efficient buildings, better material choices and improved occupant comfort are the primary skills acquired at the intermediate level through this certificate.

Students will furthermore understand the foundations of sustainability and learn the skills to apply sustainability ratings, understand the operational role of building systems and social value of building form and space and learn the tools to simulate, measure and increase sustainability at the building as well as the urban scale.

At this time, the certificate in Sustainable Architecture is available only to Architecture majors.

For more information and how to apply, click here.

Program of Study

Code	Title	Credit Hours
Required		
ARCH 4227	Architecture and Ecology	3
ARCH 4226	Green Construction	3
ARCH 4231	Environmental Systems and Design Integration II	3
Elective		**3**
ARCH 4151	History of Urban Form	
ARCH 4320	Retrofitting Suburbia	
ARCH 4447	Urban Ecological Design	
ARCH 4805	Design Build South Africa I	
ARCH 4801	Design Build South Africa II	
Total Credit Hours		**12**

- Courses must be completed with a 'C' grade or higher
- Courses used to satisfy the certificate requirements may be used to fulfill free electives required by the Institute as well as Architecture electives for Architecture majors.

Undergraduate Embedded Certificate in Sustainable Business

The coursework in the Certificate for Sustainable Business will prepare student to apply a sustainability lens to challenging business problems to help shape and make business decisions.

Program of Study

This certificate is available to all undergraduate students at Georgia Tech. It requires a minimum of 12 credits. The students must earn a grade of "C" or higher in all of the courses to qualify.

Code	Title	Credit Hours
Select two (2) courses (Group A):		6
MGT 3607	Business Ethics	
MGT 3770	Business Decisions for Sustainability and Shared Value	
MGT 4369	Sustainable Business Consulting Practicum	
SLS 3120	Foundations of Sustainable Systems	
Select two (2) courses (Group B):		6
CEE 3000	Civil Engineering Systems	
CEE 4150	Construction Management & Megaprojects	
CEE 4300	Environmental Engineering Systems	
CS 4745	Information and Communication Technologies and Global Development	
HTS 3064	Sociology of Development	
HTS 3081	Technology and the Environment	
MGT 4010	Business Taxation	
INTA 4745	Information and Communication Technologies and Global Development	
ISYE 4501	Energy, Efficiency, and Sustainability	
MGT 3743	Analysis of Emerging Technologies	
MGT 4194	Social Enterprise and Entrepreneurship	
MGT 4803	Social Impact: In-depth Exploration and Design	
PHIL 4176	Environmental Ethics	
PUBP 3320	Climate Policy	
PUBP 3350	Energy Policy	
PUBP 3600	Sustainability, Technology, and Policy	
PUBP 4226	Business and Government	
SLS 3110	Technology and Sustainable Community Development	
Any remaining courses from Group A		
Total Credit Hours		**12**

COURSES

Accounting (ACCT)

ACCT 2101. Accounting I: Financial Accounting. 3 Credit Hours.
An introduction to the measurement and financial reporting of organizations and the interpretation of the resulting financial statements. Credit not allowed for MGT 3000 and ACCT 2101.

ACCT 2102. Accounting II: Managerial Accounting. 3 Credit Hours.
The course deals with determining the costs of products and services and using cost information for planning and decision making. Credit not allowed for MGT 3000 and ACCT 2102.

Aerospace Engineering (AE)

AE 1355. Aerospace Systems Design Competition I. 3 Credit Hours.
Team-oriented aerospace systems design project directed by a faculty advisor. Typically a national student competition in aircraft, rotorcraft, or spacecraft design. Technical role commensurate with freshman standing.

AE 1601. Introduction to Aerospace Engineering. 1 Credit Hour.
Overview of aerospace engineering. Common terminology, introduction to use of engineering models, professional and ethical standards and experience with team-based design of aerospace systems. Students cannot receive credit for both AE 1601 and AE 1350.

AE 1750. Introduction to Bioengineering. 3 Credit Hours.
An introduction to the field of bioengineering, including the application of engineering principles and methods to problems in biology and medicine, the integration of engineering with biology, and the emerging industrial opportunities. Crosslisted with BMED, CHE, ECE, ME, and MSE 1750.

AE 1XXX. Aerospace Engineering Elective. 1-21 Credit Hours.

AE 2010. Thermodynamics & Fluids Fundamentals. 4 Credit Hours.
Thermodynamic and fluid properties. Conservation laws, Isentropic flow, shocks and expansions, introduction to flows with friction and heat transfer. Applications to aerospace devices. Students cannot receive credit for both AE 2010 and AE 3450.

AE 2010R. AE 2010 Recitation. 0 Credit Hours.
This recitation is an optional session in support of AE 2010. This course is designed to allow students the chance to apply their knowledge of concepts through problem solving and group discussions.

AE 2011. Fluid Fundamentals. 2 Credit Hours.
Flowfield concepts, fluid properties, conservation equations for flows, isentropic flow, shocks and expansions, introduction to flows with friction and heat transfer. Applications to aerospace devices.

AE 2011R. AR 2011 Recitation. 0 Credit Hours.
This recitation is an optional session in support of AE 2011. This course is designed to allow students the chance to apply their knowledge of concepts through problem solving and group discussions.

AE 2220. Dynamics. 3 Credit Hours.
Motion of particles and mass center of bodies, kinematics and kinetics of rigid bodies in plane motion, work-energy and impulse-momentum methods, 3-D dynamics of rigid bodies.

AE 2220R. AE 2220 Recitation. 0 Credit Hours.
This recitation is an optional session in support of AE 2220. This course is designed to allow students the chance to apply their knowledge of concepts through problem solving and group discussions.

AE 2221. 3D Dynamics. 1 Credit Hour.
Kinematics and kinetics of rigid bodies in three-dimensional motion.

AE 2221R. AE 2221 Recitation. 0 Credit Hours.
This recitation is an optional session in support of AE 2221. This course is designed to allow students the chance to apply their knowledge of concepts through problem solving and group discussions.

AE 2355. Aerospace Systems Design Competition II. 3 Credit Hours.
Team-oriented aerospace systems design project directed by a faculty advisor. Typically a national student competition in aircraft, rotorcraft, or spacecraft design. Technical role commensurate with sophomore standing.

AE 2610. Introduction to Experimental Methods in Aerospace. 1 Credit Hour.
Introduction to laboratory instrumentation and measurement techniques used in aerospace. Basic application of sensor principles, uncertainty analysis, interpretation and analysis of experimental data, and documentation.

AE 2611. Technical Communications for Aerospace Engineers. 1 Credit Hour.
Development of technical communication skills required by aerospace engineers. Includes written, oral and visual communication methods.

AE 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

AE 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

AE 2801. Special Topics. 1 Credit Hour.
Normally taken by sophomores. Course material devoted to special topics in aerospace engineering.

AE 2802. Special Topics. 2 Credit Hours.
Normally taken by sophomores. Course material is devoted to special topics in aerospace engineering.

AE 2803. Special Topics. 3 Credit Hours.
Normally taken by sophomores. Course material devoted to special topics in aerospace engineering.

AE 2901. Special Problems. 1-21 Credit Hours.
Research topic selected in consultation with advisor. A brief description, endorsed by the faculty advisor, must be approved by the School.

AE 2902. Special Problems. 1-21 Credit Hours.
Research topic selected in consultation with advisor. A brief description, endorsed by the faculty advisor, must be approved by the School.

AE 2903. Special Problems. 1-21 Credit Hours.
Research topic selected in consultation with advisor. A brief description, endorsed by the faculty advisor, must be approved by the School.

AE 2XXX. Aeorspace Engineering Elective. 1-21 Credit Hours.

AE 3030. Aerodynamics. 4 Credit Hours.
Aerodynamics of airfoils and wings in subsonic, transonic and supersonic flight. Laminar and turbulent boundary layers and effects of viscosity on aerodynamic performance.

AE 3030R. Aerodynamics Recitation. 0 Credit Hours.
Recitation course for AE 3030.

AE 3090. Numerical Methods for Aerospace Engineering. 3 Credit Hours.
Basic numerical methods in Aerospace Engineering taught in Fortran or C, language instruction included. Numerical integration, interpolation, FFT, linear algebra, initial and boundary value problems.

AE 3140. Structural Analysis. 3 Credit Hours.
Application to structural analysis. Basic equations of elasticity. Bending, shearing and torsion of thin walled structures. Energy methods for structural analysis and application to finite element theory for trusses and beam structures. Students cannot receive credit for both AE 3140 and AE 3125.

AE 3330. Introduction to Aerospace Vehicle Performance. 3 Credit Hours.
Orbital mechanics, orbit determination, and spacecraft maneuvers. Basics of airplane flight including climb, cruise, takeoff, and landing. Actuator disk theory and elements of rotorcraft performance.

AE 3340. Design and Systems Engineering Methods. 2 Credit Hours.
Overview of aerospace design and systems engineering. Tools to organize the design process and to support design decisions. Introduction to numerical optimization and trade studies.

AE 3355. Aerospace Systems Design Competition III. 3 Credit Hours.
Team-oriented aerospace systems design project directed by a faculty advisor. Typically a national student competition in aircraft, rotorcraft, or spacecraft design. Technical or leadership role commensurate with junior standing.

AE 3450. Thermodynamics and Compressible Flow. 3 Credit Hours.
First and second laws of thermodynamics. Thermodynamic properties and state equations. Isentropic flow. Flows with shocks and expansions. Flows with friction and heat transfer. Students cannot receive credit for both AE 3450 and AE 2010.

AE 3530. System Dynamics and Vibration. 3 Credit Hours.
Modeling and analysis of lumped- and distributed-parameter systems, free and forced vibration in mechanical systems, free vibration in structural systems. Students cannot receive credit for both AE 3530 and ME 3017 or AE 3530 and AE 3515.

AE 3531. Control System Analysis and Design. 3 Credit Hours.
Control system performance analysis and specifications, classical methods of control system analysis and design, introduction to modern control methods. Students cannot receive credit for AE 3531 and AE 3515 or AE 3531 and ME 4452.

AE 3610. Experiments in Fluid and Solid Mechanics. 2 Credit Hours.
Experimental laboratory in solid and fluid mechanics, aerodynamics, propulsion. Emphasis on measurement techniques, analysis and interpretation of data, comparison to analytical predictions, and reporting.

AE 3801. Special Topics. 1 Credit Hour.
Normally taken by juniors. Course material devoted to special topics in aerospace engineering.

AE 3802. Special Topics. 2 Credit Hours.
Normally taken by juniors. Course material devoted to special topics in aerospace engineering.

AE 3803. Special Topics. 3 Credit Hours.
Normally taken by juniors. Course material devoted to special topics in aerospace engineering.

AE 3901. Special Problems. 1-21 Credit Hours.
Research topic selected in consultation with advisor. A brief description, endorsed by the faculty advisor, must be approved by the School.

AE 3902. Special Problems. 1-21 Credit Hours.
Research topic selected in consultation with advisor. A brief description, endorsed by the faculty advisor, must be approved by the School.

AE 3903. Special Problems. 1-21 Credit Hours.
Research topic selected in consultation with advisor. A brief description, endorsed by the faculty advisor, must be approved by the School.

AE 3XXX. Aerospace Engineering Elective. 1-21 Credit Hours.

AE 4040. Computational Fluid Dynamics. 3 Credit Hours.
Discretization of PDEs, stability and accuracy considerations, iterative and time/space marching schemes, aerospace applications.

AE 4060. Aeroacoustics. 3 Credit Hours.
Concepts and techniques, noise sources, data acquisition and reduction, aeroacoustic resonances, commonalities in the music of wind instruments and sources of aircraft noise, community impact.

AE 4070. Introduction to Propeller and Rotor Theory. 3 Credit Hours.
A study of the theory and equations used in the design of propellers and helicopter rotors.

AE 4071. Rotorcraft Aeromechanics. 3 Credit Hours.
Basic rotor aerodynamics and dynamics, helicopter performance and trim, introduction to helicopter stability, control and vibration.

AE 4080. Aerothermodynamics. 3 Credit Hours.
Convective heat transfer and viscous drag in high- temperature and high-speed flowfields. Inviscid hypersonic theory, real gas effects, and wall thermal protection strategies.

AE 4132. Finite Element Analysis. 3 Credit Hours.
An introduction to classical approximation techniques and the fundamentals of the finite element-method applied to structures and structural dynamics with aerospace applications.

AE 4170. Structural Integrity and Durability. 3 Credit Hours.
Multiaxial stress states, inelasticity in metals and polymers, yield criteria, metal fatigue, fracture, stress intensity factors, fracture toughness, fatigue crack growth, metal creep, and polymer viscoelasticity.

AE 4220. Structural Dynamics and Aeroelasticity. 3 Credit Hours.
Structural dynamics of one-dimensional systems. Analysis of static aeroelastic phenomena, unsteady aerodynamics, and flutter. Equations of motion for complete aeroelastic systems; solution techniques.

AE 4311. Aircraft Design I: Conceptual Design. 3 Credit Hours.
Conceptual design and synthesis of fixed wing aircraft.

AE 4312. Aircraft Design II: Preliminary Design. 3 Credit Hours.
Preliminary design and synthesis of fixed wing aircraft.

AE 4321. Space System Design I: Conceptual Design. 3 Credit Hours.
Conceptual design and synthesis of space systems. Students apply mission and spacecraft design principles.

AE 4322. Space System Design II: Mission Design. 3 Credit Hours.
Advanced design applications of space systems. Students apply mission and spacecraft design principles.

AE 4331. Rotorcraft Design I: Conceptual Design. 3 Credit Hours.
Conceptual design of traditional, urban air mobility, unmanned rotorcraft vehicles.

AE 4332. Rotorcraft Design II: Preliminary Design. 3 Credit Hours.
Preliminary design of traditional, urban air mobility, unmanned rotorcraft vehicles.

AE 4341. Aircraft Design. 3 Credit Hours.
Aircraft Vehicle Design. Preliminary design or case study of a complete flight vehicle, including a propulsion system, a structural system, and a control system. Students cannot receive credit for both AE 4341 and AE 4350.

AE 4342. Space System Design. 3 Credit Hours.
Spacecraft subsystems and synthesis. Students apply mission and spacecraft design principles in developing a space flight mission concept. Topics may vary. Students cannot receive credit for AE 4342 and AE 4356.

AE 4343. Rotorcraft Design. 3 Credit Hours.
Rotorcraft Vehicle Design. Preliminary design or case study of a complete rotorcraft flight vehicle, including a propulsion system, a structural system, and a control system. Students cannot receive credit for both AE 4343 and AE 4358 or AE 4343 and AE 6333.

AE 4355. Aerospace Systems Design Competition IV. 3 Credit Hours.
Team-oriented aerospace systems design project directed by a faculty advisor. Typically a national student competition in aircraft, rotorcraft, or spacecraft design. Technical or leadership role commensurate with senior standing.

AE 4361. Space Flight Operations. 3 Credit Hours.
This course introduces the foundations and analysis of space flight operations for human and robotic space missions.

AE 4370. Life Cycle Cost Analysis. 3 Credit Hours.
Modeling of total cost of complex systems over their entire life cycle. Modeling risk uncertainty for complex energy, environmental, and military systems.

AE 4376. Accident Causation and System Safety. 2 Credit Hours.
This course provides an in-depth examination of the multi-disciplinary issues in accident causation and system safety (prevention) across different industries.

AE 4451. Jet and Rocket Propulsion. 3 Credit Hours.
Principles of aerospace propulsion systems. Thermodynamic cycles. Thermodynamics of combustion. Turbine engine and rocket performance characteristics. Cycle/component analysis of engines and turbomachinery.

AE 4453. Advanced Aircraft Propulsion. 3 Credit Hours.
Analysis, preliminary design of turbomachinery and combustors for aircraft; engine design, off-design performance. Introduction to advanced architectures: including scramjets, pressure gain combustion, electric propulsion.

AE 4461. Introduction to Combustion. 3 Credit Hours.
Basics of combustion and combustion devices. Chemical thermodynamics, reaction rates, premixed/nonpremixed flames, ignition, stabilization, and pollutants. Applications in turbine, rocket, and internal combustion engines.

AE 4531. Aircraft Flight Dynamics. 3 Credit Hours.
Three-dimensional rigid body dynamics, aircraft equations of motion, static and dynamic stability, flight control design, introduction to aeroelastic phenomena. Students cannot receive credit for both AE 4531 and AE 3521.

AE 4532. Spacecraft Flight Dynamics. 3 Credit Hours.
Cover fundamental material in orbit and attitude dynamics. Investigate orbits, rendezvous/intercept maneuvers, interplanetary transfers, attitude coordinates, attitude stability, attitude control, and attitude estimation. Students cannot receive credit for both AE 4532 and AE 4310.

AE 4552. Introduction to Humans & Autonomy. 3 Credit Hours.
Learn the fundamental principles underlying the functions performed by humans and by autonomous systems in dynamic, complex domains. Credit will not be awarded for both AE 4552 and AE 6552.

AE 4580. Introduction to Avionics Integration. 3 Credit Hours.
Avionics in modern aerospace vehicle systems, including impact on design and performance. Specific case-studies; covers: navigation, GPS, stability augmentation, radar, health monitoring, databases, human factors, and software.

AE 4610. Dynamics and Control Laboratory. 2 Credit Hours.
Experiments in dynamics and control related to aerospace engineering topics.

AE 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

AE 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

AE 4701. Wind Engineering. 3 Credit Hours.
An introductory course on wind energy and its potential; modeling and design of wind turbines; analysis of the economic benefits of wind turbine systems. Credit not allowed for both AE 4701 and ME 4701.

AE 4757. Biofluid Mechanics. 3 Credit Hours.
Introduction to the study of blood flow in the cardiovascular system. Emphasis on modeling and the potential of flow studies for clinical research application. Crosslisted with CHE and ME 4757.

AE 4758. Biosolid Mechanics. 3 Credit Hours.
The mechanics of living tissue, e.g., arteries, skin, heart muscle, ligament, tendon, cartilage, and bone. Constitutive equations and some simple mechanical models. Mechanics of cells. Applications. Crosslisted with CHE and ME 4758.

AE 4760. Engineering Acoustics and Noise Control. 3 Credit Hours.
Study of acoustics related to noise and its control; acoustics terminology wave propagation, wave equation solutions, instrumentation, data processing, room acoustics, noise control, noise legislation. Crosslisted with ME 4760.

AE 4791. Mechanical Behavior of Composites. 3 Credit Hours.
Stress-strain behavior of composites, property of matrix and reinforcing materials, mechanics of fiber-reinforced composites, lamina and laminate analysis, and mechanical performance. Crosslisted with CEE, CHE, ME, MSE, and PTFE 4791.

AE 4793. Composite Materials and Processes. 3 Credit Hours.
Basic principles of selection and design of composite materials and their manufacturing and testing. Cost factors. Laboratory exercises on manufacturing and tests. Crosslisted with CEE, CHE, ME, MSE, and PTFE 4793.

AE 4794. Composite Materials and Manufacturing Testing. 4 Credit Hours.
Basic principles of selection and sign of composite materials and their manufacturing and testing. Cost factors. Laboratory exercises on manufacturing and tests. Crosslisted with CEE, CHE, ME, MSE, and PTFE 4794.

AE 4801. Special Topics. 1 Credit Hour.
Normally taken by seniors. Course material devoted to special topics in aerospace engineering.

AE 4802. Special Topics. 2 Credit Hours.
Normally taken by seniors. Course material devoted to special topics in aerospace engineering.

AE 4803. Special Topics. 3 Credit Hours.
Normally taken by seniors. Course material devoted to special topics in aerospace engineering.

AE 4804. Special Topics. 4 Credit Hours.
Normally taken by seniors. Course material devoted to special topics in aerospace engineering.

AE 4806. Special Topics. 3 Credit Hours.
Special Topics.

AE 4863. Special Topics. 3 Credit Hours.
Special Topics in Aerospace Engineering.

AE 4864. Special Topics. 4 Credit Hours.
Special Topics in Aerospace Engineering.

AE 4883. Special Topics. 3 Credit Hours.

AE 4901. Special Problems in Aerospace Engineering. 1-21 Credit Hours.
Research topic selected in consultation with advisor. A brief description, endorsed by the faculty advisor, must be approved by the School.

AE 4902. Special Problems in Aerospace Engineering. 1-21 Credit Hours.
Research topic selected in consultation with advisor. A brief description, endorsed by the faculty advisor, must be approved by the School.

AE 4903. Special Problems. 1-21 Credit Hours.
Research topic selected in consultation with advisor. A brief description, endorsed by the faculty advisor, must be approved by the School.

AE 4XXX. Aerospace Engineering Elective. 1-21 Credit Hours.

AE 6009. Viscous Fluid Flow. 3 Credit Hours.
Fundamental conservation laws. Laminar flows, wall-bound and free shear flows. Separation, heat transfer, and compressibility effects. Introduction to flow instability and transition to turbulence.

AE 6012. Turbulent Flows. 3 Credit Hours.
Basic characteristics of turbulence. Statistical methods. Reynolds averaging, kinetic energy budget, and scaling issues. Homogeneity and isotrophy. Free and wall bounded shear flows. Simulation and modeling.

AE 6015. Advanced Aerodynamics. 3 Credit Hours.
Introduce concepts, derivation and application of aerodynamic fundamentals. Emphasis on advanced knowledge in analysis and design of fixed-wing, launch/atmospheric return vehicles, and rotating systems.

AE 6020. High-Speed Flow. 3 Credit Hours.
Transonic small disturbance theory. Transonic potential flow modeling. Supercritical airfoil design. Physics of hypersonic flow. Newtonian flow. Modeling of hypersonic viscous and inviscid flow.

AE 6030. Unsteady Aerodynamics. 3 Credit Hours.
Unsteady potential theory for various speed ranges. Calculation of steady and unsteady aerodynamic loads on airfoils and wings. Vortex flows. Topics of current research interest.

AE 6042. Computational Fluid Dynamics. 4 Credit Hours.
Finite-difference, finite volume methods for solution of Navier-Stokes and Euler equations. Classification of equations, stability, grids, boundary conditions, implicit and explicit methods, turbulence modeling.

AE 6050. High-temperature Gas Dynamics I. 3 Credit Hours.
Defining equations for compressible flows, real gas properties and their effect on the behavior of equilibrium and non-equilibrium flows.

AE 6060. Aeroacoustics. 3 Credit Hours.
Lighthill's theory of aerodynamic noise and extensions, flow/acoustic interactions, feedback phenomenon, supersonic jet noise, aeroacoustics of ducts, propeller noise, helicopter noise, sonic boom.

AE 6070. Rotary Wing Aerodynamics. 3 Credit Hours.
Vortex wake modeling; analytical inflow theories; modern computational methods for rotary wing aerodynamic analysis; aerodynamic noise.

AE 6080. Dynamics of Turbulence. 3 Credit Hours.
Fundamental physics of turbulent flows. Vorticity dynamics, Kolmogorov similarity hypotheses and nonlinear interactions. Mixing and dispersion. Direct and large-eddy simulations, Reynolds stress modeling. Advanced topics.

AE 6100. Advanced Structural Analysis I. 3 Credit Hours.
Stability of elastic systems under quasi-static loads. Classical, kinetic, and potential energy approaches through rigid member models. Buckling of elastic bars and frames. Energy methods.

AE 6106. Analysis of Aerospace Structural Elements. 3 Credit Hours.
This course focuses on the analysis of advanced aerospace structures. Beam theory is reviewed, plate theory is introduced. Classical and energy solutions are presented.

AE 6114. Fundamentals of Solid Mechanics. 3 Credit Hours.
Unified overview of fundamental aspects of solid mechanics, from nonlinear continuum mechanics to linear elasticity, including an introduction to energy methods and other special topics.

AE 6115. Fundamentals of Aerospace Structural Analysis. 3 Credit Hours.
Overview and fundamentals of aerospace structural analysis, including virtual work and energy methods, buckling and advanced structural theories.

AE 6170. Structural Optimization. 3 Credit Hours.
Mathematical methods of constrained optimization, sensitivity analysis, approximation concepts, decomposition techniques, shape optimization in the context of structural design.

AE 6200. Advanced Aeroelasticity I. 3 Credit Hours.
Understanding and analysis of aeroelastic phenomena in fixed-wing aircraft, static aeroelasticity, dynamic aeroelasticity, and dynamic response and transient stresses in aircraft structures.

AE 6210. Advanced Dynamics I. 3 Credit Hours.
Kinematics of particles and rigid bodies, angular velocity, inertia properties, holonomic and nonholonomic constraints, generalized forces.

AE 6211. Advanced Dynamics II. 3 Credit Hours.
A continuation of AE 6210. Equations of motion, Newtonian frames, consistent linearization, energy and momentum integrals, collisions, mathematical representation of finite rotation.

AE 6220. Rotorcraft Structural Dynamics and Aeroelasticity. 3 Credit Hours.
Elementary blade dynamics, flap-lag dynamics, ground resonance, structural dynamics of rotating beams, nonlinear elastic blade analysis, harmonic balance and trim, Floquet theory.

AE 6230. Structural Dynamics. 3 Credit Hours.
Dynamic response of single-degree-of-freedom systems, Lagrange's equations; modal decoupling; vibration of Euler-Bernoulli and Timoshenko beams, membranes and plates.

AE 6270. Applied Nonlinear Dynamics. 3 Credit Hours.
Nonlinear vibration methods through averaging and multiple scales, bifurcation, periodic and quasi-periodic systems, transition to chaos, characterization of chaotic vibrations, thermodynamics of chaos, chaos control.

AE 6310. Optimization for the Design of Engineered Systems. 3 Credit Hours.
Introduction to optimization problem formulations for engineering design, algorithms for constrained nonlinear programming, multiobjective and multidisciplinary optimization, and robust design optimization.

AE 6333. Rotorcraft Design I. 3 Credit Hours.
System approach to conceptual design of aerospace systems with emphasis on rotorcraft. Comprehensive methodologies for aerospace vehicle synthesis and sizing. Integration of technologies. Students cannot receive credit for both AE 6333 and AE 4343.

AE 6334. Rotorcraft Design II. 4 Credit Hours.
Students work together on this application to complete the preliminary design stage of a specific rotorcraft. Participants are exposed to disciplinary and interdisciplinary issues.

AE 6343. Aircraft Design I. 3 Credit Hours.
Stochastic approach to conceptual design of aerospace systems with emphasis on aircraft and missiles. Comprehensive methodologies for aerospace vehicle synthesis and sizing. Integration of technologies.

AE 6344. Aircraft Design II. 4 Credit Hours.
Students work together on this application to complete the preliminary design stage of a specific aircraft or missile. Participants are exposed to disciplinary and interdisciplinary issues.

AE 6353. Orbital Mechanics. 3 Credit Hours.
First graduate-level astrodynamics class that includes two-body orbital mechanics, orbit determination, orbit prediction, orbital maneuvers, lunar and interplanetary trajectories, orbital rendzvous and space navigation.

AE 6355. Planetary Entry, Descent and Landing. 3 Credit Hours.
Entry flight mechanics and dynamics, aerothermodynamics, thermal protection systems, aerodynamic decelerators, descent and landing. Robotic and human exploration mission studies for aerobraking, planetary entry, aerocapture.

AE 6356. Spacecraft Attitude Estimation and Control. 3 Credit Hours.
Attitude representations, dynamics, estimation, and control. Spacecraft attitude sensors and actuators. Attitude determination and control topics applied to spacecraft and space missions.

AE 6361. Air Breathing Propulsion System Design I. 3 Credit Hours.
Air breathing propulsion design with emphasis on multidisciplinary design issues related to system integration, cycle selection, performance, cost, reliability, maintainability, etc.

AE 6362. Safety by Design. 4 Credit Hours.
Autonomous situational flight model allows students to examine complex behaviors in the "pilot-vehicle-operational conditions" system. Flight certification and airworthiness requirements are mapped into formal scenarios.

AE 6372. Aerospace Systems Engineering. 3 Credit Hours.
Introduction to aerospace systems engineering. Systems engineering and quality engineering methods and tools. Top-down design decision support processes, computer integrated environments, Integrated Product/Process Development (IPPD).

AE 6373. Advanced Design Methods I. 4 Credit Hours.
Introduction to modern probabilistic design methods and techniques. Design of experiments, Taguchi methods, response surface equations, robust design, risk and uncertainty, technology assessment and selection.

AE 6383. Applied Design Laboratory. 1 Credit Hour.
Introduction to computing tools and processes used in subsequent applied design courses in graduate fixed wing, rotary wing, and space systems design tracks.

AE 6393. Introduction to System of Systems Engineering Principles. 3 Credit Hours.
Introduce students to the development and analysis of complex System of Systems, and their practical application to formulate Grand Challenge projects.

AE 6394. System of Systems Engineering Applications. 4 Credit Hours.
Application of developed System of Systems analysis frameworks for the performance of Grand Challenge projects.

AE 6410. Combustion Dynamics. 3 Credit Hours.
Acoustic wave propagation in inhomogeneous flows, flame-acoustic wave interactions, and control of combustion-driven oscillations.

AE 6412. Turbulent Combustion. 3 Credit Hours.
Fundamentals of interaction between flow turbulence and reactive scalars. Theoretical, numerical, and experimental methods. Physics of premixed, non-premixed, and partially premixed turbulent combustion.

AE 6440. Turbine Engine Aerothermodynamics. 3 Credit Hours.
Analysis and design of gas turbine engine components including axial flow compressors, turbines, inlets, and nozzles. Heat transfer and turbine blade cooling.

AE 6450. Rocket Propulsion. 3 Credit Hours.
Analysis and design of rocket engines including liquid, solid, hybrid, and advanced propulsion systems.

AE 6451. Electric Propulsion. 3 Credit Hours.
The course provides a solid background of the operating principles, performance characteristics, and design features of the state-of-the-art electric propulsion systems.

AE 6503. Helicopter Stability and Control. 3 Credit Hours.
Helicopter general equations of motion, rotor forces and moments, helicopter stability and control characteristics, handling qualities, flight control system design.

AE 6505. Random Processes and Kalman Filtering. 3 Credit Hours.
Probability and random variables and processes; correlation; shaping filters; simulation of sensor errors; Wiener filter; random vectors; covariance propagation; recursive least-squares; Kalman filter; extensions.

AE 6506. Aerospace Guidance and Navigation. 3 Credit Hours.
Earth's shape and gravity. Introduction to inertial navigation. GPS aiding. Error analysis. Guidance systems. Analysis of the guidance loop. Estimation of guidance variables. Adjoint analysis.

AE 6511. Optimal Guidance and Control. 3 Credit Hours.
Euler-Lagrange formulation; Hamilton-Jacobi approach; Pontryagin's minimum principle; Systems with quadratic performance index; Second variation and neighboring extremals; Singular solutions; numerical solution techniques.

AE 6520. Advanced Flight Dynamics. 3 Credit Hours.
Reference frames and transformations, general equations of unsteady motion, application to fixed-wing, rotary-wing and space vehicles, stability characteristics, flight in turbulent atmosphere.

AE 6530. Multivariable Linear Systems and Control. 3 Credit Hours.
Techniques for analysis and description of multivariable linear systems. Tools for advanced feedback control design for these systems, including computational packages. Credit will not be awarded for both AE 6530 and ECE 6550 or AE 6530 and ME 6401.

AE 6531. Aerospace Robust Control I. 3 Credit Hours.
Robustness issues in controller analysis and design. LQ analysis, H2 norm, LQR, LQG, uncertainty modeling, small gain theorem, H-infinity performance, and the mixed-norm H2/H-infinity problem.

AE 6532. Aerospace Robust Control II. 3 Credit Hours.
Advanced treatment of robustness issues. Controller analysis and design for linear and nonlinear systems with structured and non-structured uncertainty. Reduced-order control, stability, multipliers, and mixed-mu.

AE 6534. Control of Aerospace Structures. 3 Credit Hours.
Advanced treatment of control of flexible structures. Topics include stability of multi-degree-of-freedom systems, passive and active absorbers and isolation, positive real models, and robust control for flexible structures.

AE 6551. Cognitive Engineering. 3 Credit Hours.
Cognitive engineering addresses a range of technologies and work environments that will support human cognitive performance, including information systems, decision support, automation, and intelligent systems.

AE 6580. Aerospace Nonlinear Control. 3 Credit Hours.
Advanced treatment of nonlinear robust control. Lyapunov stability theory, absolute stability, dissipativity, feedback linearization, Hamilton-Jacobi-Bellman theory, nonlinear H-infinity, backstepping control, and control Lyapunov functions.

AE 6694. Graduate Internship. 1-21 Credit Hours.
Graduate Internship for which the student is paid.

AE 6701. Wind Engineering. 3 Credit Hours.
An introductory course on wind energy and its potential; modeling and design of wind turbines; analysis of the economic benefits of wind turbine systems. Credit will not be awarded for both AE 6701 and ME 6701.

AE 6705. Introduction to Mechatronics. 4 Credit Hours.
Modeling and control of actuators and electro-mechanical systems. Performance and application of microprocessors and analog electronics to modern mechatronic systems.

AE 6721. Evaluation of Human Integrated Systems. 3 Credit Hours.
Evaluation of human integrated systems including translating research questions into measurable objectives, overview of evaluation methods and data analysis techniques applicable to such systems. Credit not allowed for both AE 6721 and ISYE 6231.

AE 6760. Acoustics I. 3 Credit Hours.
Fundamental principles governing the generation, propagation, reflection, and transmission of sound waves in fluids. Crosslisted with ME 6760.

AE 6761. Acoustics II. 3 Credit Hours.
Radiation and scattering of sound waves in fluids, duct acoustics, dissipation phenomena. Crosslisted with ME 6761.

AE 6762. Applied Acoustics. 3 Credit Hours.
Mufflers, resonators, acoustic materials, barriers, industrial noise, room acoustics, active noise control. Crosslisted with ME 6762.

AE 6765. Kinetics and Thermodynamics of Gases. 4 Credit Hours.
Thermodynamics of nonreacting and reacting gas mixtures. Introductory quantum theory, statistical thermodynamics, and gas kinetic theory. Crosslisted with ME 6765.

AE 6766. Combustion. 3 Credit Hours.
Introductory chemical kinetics, detonations and deflagrations, laminar flame propagation in premixed gases, ignition and quenching, laminar diffusion flames and droplet burning, turbulent reacting flows. Crosslisted with ME 6766.

AE 6769. Linear Elasticity. 3 Credit Hours.
Governing equations of linear elasticity, plane elasticity, boundary value problems, airy stress function and complex variable methods, simple three-dimensional solutions. Crosslisted with ME 6769.

AE 6770. Energy and Variational Methods in Elasticity and Plasticity. 3 Credit Hours.
Applications of energy and variational methods in engineering mechanics to elastic, plastic, and dynamical behavior of deformable bodies. Crosslisted with ME 6770.

AE 6779. Dynamic System Simulation and Modeling. 3 Credit Hours.
Models of dynamic systems, such as aircraft, ground vehicles and machinery, and manual control. Numerical simulation techniques and applications. Interactive simulators. Student programming project. Crosslisted with ISYE 6779.

AE 6XXX. Aerospace Engineering Elective. 1-21 Credit Hours.

AE 7000. Master's Thesis. 1-21 Credit Hours.

AE 7741. Robotics Professional Preparation. 1 Credit Hour.
Preparation for a professional career in Robotics. Local & visiting speakers. Program introduction. Technical resume preparation. GT Robotics labs & resources.

AE 7742. Robotics Professional Preparation 2. 1 Credit Hour.
Preparation for a professional career in Robotics. Local & visiting speakers. Selecting and applying for Internship. Developing capstone project proposal. Public speaking practice and preparation.

AE 7743. Robotics Professional Preparation 3. 1 Credit Hour.
Preparation for a professional career in Robotics. Local & visiting speakers. Interview preparation & career search. Technical report writing and presentation.

AE 7764. Acoustic Propagation. 3 Credit Hours.
Propagation of sound in inhomogeneous fluids; ray acoustics, ocean and atmospheric acoustics, nonlinear acoustics. Crosslisted with ME 7764.

AE 7772. Fundamentals of Fracture Mechanics. 3 Credit Hours.
Advanced study of failure of structural materials under load, mechanics of fracture, and microscopic and macroscopic aspects of the fracture of engineering materials. Crosslisted with CHE, CEE, ME, and MSE 7772.

AE 7773. Advanced Fracture Mechanics. 3 Credit Hours.
Nonlinear fracture mechanics including elastic-plastic and time-dependent fracture, advanced test methods, J-integral theory, and extensions. Crosslisted with CEE, CHE, ME, and MSE 7773.

AE 7774. Fatigue of Materials and Structures. 3 Credit Hours.
Mechanical and microstructural aspects of nucleation and growth of cracks under cyclic loading conditions, notch effects, cumulative damage, multiaxial loading, and fatigue crack propagation. Crosslisted with CEE, CHE, ME, and MSE 7774.

AE 7775. Topics in Fracture and Fatigue of Metallic and Composite Structures. 3 Credit Hours.
Brittle and ductile fracture criteria. Failrue prediction in composite structures. Free-edge and internal delamination. Anisotropic cracks. Fatigue behavior of composites and metal. New micromechanical models. Crosslisted with CHE, ME, and MSE 7775.

AE 7785. Introduction to Robotics Resesarch. 3 Credit Hours.
Familiarizes students with the core areas of robotics; mechanics, control, perception, AI, and autonomy. Provides an introduction to the mathematical tools required in robotics research.

AE 7791. Damage, Failure, and Durability of Composite Materials. 3 Credit Hours.
Analysis and failure of fiber-reinforced composite material systems. Mechanisms of toughening, multiple cracking mechanisms. Failure in woven fabric, braided, and special geometry composites. Crosslisted with CHE, CEE, ME, MSE, and PTFE 7791.

AE 7792. Advanced Mechanics of Composites. 3 Credit Hours.
Anisotropic elasticity, hygrothermal behavior, stress analysis of laminated composites including 3D effects, stress concentrations, free-edge effects, thick laminates, adhesive and mechanical connections, fracture of composites. Crosslisted with CHE, CEE, ME, MSE, and PTFE 7792.

AE 7793. Manufacturing of Composites. 3 Credit Hours.
Major manufacturing techniques of metal-ceramic and polymer-matrix composites. Modeling of processes with emphasis on fundamental mechanisms and effects. Crosslisted with CHE, CEE, ME, MSE, and PTFE 7793.

AE 8001. Design Seminar. 1 Credit Hour.
Case studies of existing aerospace systems; assessment of design payoffs and risks; industry experts provide case examples and knowledge transfer to course participants; field trips.

AE 8002. AE Graduate Seminar. 1 Credit Hour.
Introduce AE graduate students to world-class aerospace researchers and topics, discuss and demonstrate basic graduate student resources and skills.

AE 8740. Robotics Internship. 1-21 Credit Hours.
Graduate Internship at a partner company, GTRI or a GT Robotics lab.

AE 8741. Robotics Capstone Project. 3 Credit Hours.
Teams or individuals apply the knowledge and skills acquired throughout the MS program to a faculty supervised robotics project.

AE 8750. Robotics Research Foundation I. 3 Credit Hours.
Multidisciplinary research course supervised by two robotics faculty from different schools participating in the robotics Ph.D. program.

AE 8751. Robotics Research Foundation II. 3 Credit Hours.
Continuation of AE 8751 (Robotics Research Foundation I).

AE 8801. Special Topics. 1 Credit Hour.
Special topics of current interest.

AE 8802. Special Topics. 2 Credit Hours.
Special topics of current interest.

AE 8803. Special Topics. 3 Credit Hours.
Special topics of current interest.

AE 8804. Special Topics. 4 Credit Hours.
Special topics of current interest.

AE 8805. Special Topics. 5 Credit Hours.
Special topics of current interest.

AE 8813. Special Topics. 3 Credit Hours.
Special Topics in AE.

AE 8883. Special Topics. 3 Credit Hours.

AE 8900. Special Problems. 1-21 Credit Hours.

AE 8901. Special Problems. 1-21 Credit Hours.

AE 8902. Special Problems. 1-21 Credit Hours.

AE 8903. Special Problems. 1-21 Credit Hours.

AE 8997. Teaching Assistantship. 1-9 Credit Hours.
For graduate students holding graduate teaching assistantships.

AE 8998. Research Assistantship. 1-9 Credit Hours.
For graduate students holding graduate research assistantships.

AE 8999. Preparation for Doctoral Dissertation. 1-21 Credit Hours.

AE 9000. Doctoral Thesis. 1-21 Credit Hours.

Applied Physiology (APPH)

APPH 1040. Scientific Foundations of Health. 2 Credit Hours.
Students will learn how genetics, the environment and human behavior influence well-being. Topics include health fitness, immunity, nutrition, stress management and chronic disease prevention. Credit not allowed for both APPH 1040 and APPH 1050 or HPS 1040 or APPH 1060.

APPH 1050. The Science of Physical Activity and Health. 2 Credit Hours.
Students will learn the importance of health fitness, good nutrition, stress management and chronic disease prevention. Activity portion of course will focus on training to improve fitness. Credit not allowed for both APPH 1050 and HPS 1040 or APPH 1040 or APPH 1060.

APPH 1060. Flourishing: Strategies for Well-being and Resilience. 2 Credit Hours.
This course is designed to help students improve their health/well-being and flourish by using conceptual pillars such as coping, resiliency, optimism, mindfulness, and emotional intelligence. Credit not awarded for both APPH 1060 and APPH 1040 or APPH 1050.

APPH 3802. Special Topics. 2 Credit Hours.
Topics of current interest in applied physiology.

APPH 3904. Special Problems. 1-21 Credit Hours.
Individual studies in applied physiology.

APPH 4804. Special Topics. 4 Credit Hours.
Topics of current interest in applied physiology.

APPH 4831. Special Topics. 1 Credit Hour.
Topics of current interest in applied physiology.

APPH 6202. Clinical Gait Analysis. 3 Credit Hours.
Analysis of normal and pathological human locomotion. Study of theory and instrumentation for measurement of temporal and spatial kinematics and kinetics, electromyography, and plantar pressure.

APPH 6203. Biomechanics and Kinesiology in Prosthetics and Orthotics. 2 Credit Hours.
Mechanics of human movement applied to the study of artifical limbs and braces. Emphasis on neuromuscular control, Newtonian mechanics, kinematics and kinetics.

APPH 6209. Clinical Pathology. 2 Credit Hours.
Systems level overview of human pathology with emphasis on the effect of disease on human movement and neuromechanical function.

APPH 6211. Systems Physiology I: Cellular Mechanisms of Plasticity. 3 Credit Hours.
The course will focus on adaptations of skeletal, muscular, and neural systems at the cellular level.

APPH 6212. Systems Physiology II: Physiology of Neuromotor Tissues. 3 Credit Hours.
The course will focus on function and adaptations of skeletal, muscular, and neural systems. Interactions among the various systems and their plasticity will be emphasized.

APPH 6213. Systems Physiology III: Integrated Systems and Adaptation. 3 Credit Hours.
The course will focus on integrative mechanism impacting motor system performance. Interactions among the various systems and their plasticity will be emphasized.

APPH 6214. Laboratory Rotations in Prosthetics and Orthotics. 2 Credit Hours.
This course will provide the opportunity for students in individual laboratories to support their graduate training in prosthetics and orthotics.

APPH 6215. Studies in Responsible Conduct of Research in Prosthetics and Orthotics. 3 Credit Hours.
This course will cover areas related to research ethics, the responsible use of animial and human models and collaborative research issues in prosthetics and orthotics.

APPH 6216. Studies in Rehabilitation Research: Prosthetics and Orthotics. 1 Credit Hour.
This course will provide students in the PhD Training Program in Prosthetics and Orthotics to study issues in Rehabilitation Medicine.

APPH 6225. Biostatistics. 3 Credit Hours.
Introductory statistical principles and methods of experimental design, sampling, power estimation, and hypothesis testing using ANOVA and regression.

APPH 6230. Exercise Metabolism. 3 Credit Hours.
The course will focus on the biochemical pathways that provide fuel for the human body during rest and various levels of physical activity.

APPH 6231. Biomechanical Aspects of Human Motor Control. 3 Credit Hours.
The course will examine selected motor control problems that the nervous system faces in the process of managing this mechanical complexity.

APPH 6232. Locomotion Neuromechanics. 3 Credit Hours.
This is a course that will introduce topics on the biomechanical and neural aspects of the control of limbed locomotion and movement.

APPH 6233. The Aging Movement Control System. 3 Credit Hours.
The aim of this course is to review research literature dealing with the effects of advances in age on the CNS and motor performance.

APPH 6235. Mechanics and Pathomechanics of Movement Control. 3 Credit Hours.
This course is designed to understand the potential effects of selected disorders of the neuromuscular system on movement control.

APPH 6236. Neuromuscular Physiology. 3 Credit Hours.
This course discusses the application of current experimental techniques in human studies in vivo.

APPH 6237. Methods of Human Neuroimaging. 3 Credit Hours.
The purpose of the course is to introduce various methods of functional neuroimaging in humans.

APPH 6238. Ion Channels in Health and Disease. 3 Credit Hours.
This course will examine the structure, function and regulation of ion channels from both excitable and non-excitable cells.

APPH 6239. Movement Disorders. 3 Credit Hours.
This course serves as an introduction to the clinical and research aspects of movement disorders.

APPH 6240. Cellular Physiology and Adaptation. 3 Credit Hours.
This course will focus on adaptations of skeletal, muscular and neural systems at the cellular level.

APPH 6241. Neuromotor Physiology. 3 Credit Hours.
The course will focus on function and adaptations of the skeletal, muscular and neural systems. Interactions among various systems and their plasticity will be emphasized.

APPH 6242. Integrative Physiology. 3 Credit Hours.
The course will focus on integrative mechanisms impacting motor system performance. Interactions among the various systems and their plasticity will be emphasized.

APPH 6400. Human Neuroanatomy. 3 Credit Hours.
The purpose of this course is to learn the anatomical makeup of the human nervous system. In this course we will closely examine details of central and peripheral neuroanatomy with links to function. As well, comparisons with non-human vertebrate neuroanatomy will be made.

APPH 6500. Classics in Neuroscience. 1 Credit Hour.
The purpose of this seminar is to learn and explore the history of neuroscience from a perspective of reading classic papers that have evolved.

APPH 6600. Muscle Structure and Plasticity. 3 Credit Hours.
Covers the biological processes underlying skeletal muscle structure and function, as well as rigorous mathematical models of those processes.

APPH 6710. Ethics of Biotechnology and Bioengineering Research. 3 Credit Hours.
This course examines the ethics of biotechnological research, including issues in the realm of research ethics, bioethics, and healthcare robotics.

APPH 6895. Lower Limb Orthotics I. 3 Credit Hours.
This course is the first part of a two course series and sets the essential elements of theory, technical design and patient management.

APPH 6981. Upper Limb Prosthetics. 4 Credit Hours.
Clinical training for the practice of prosthetics emphasizing adult and pediatric upper limb prostheses.

APPH 6982. Spinal Orthotics. 4 Credit Hours.
Clinical training for the practice of orthotics emphasizing adult and pediatric spinal orthoses.

APPH 6983. Upper Limb Orthotics. 3 Credit Hours.
Clinical training for the practice of orthotics emphasizing adult and pediatric upper limb orthoses.

APPH 6985. Transfemoral Prosthetics. 4 Credit Hours.
Clinical training for the practice of prosthetics emphasizing adult and pediatric transfemoral (above knee) prostheses.

APPH 6997. Assistive Technology. 1 Credit Hour.
Theories and devices associated with assistive technology and mobility aids, emphasizing topics important to clinical practice in prosthetics and orthotics.

APPH 6999. Clinical Practicum in Prosthetics and Orthotics. 1-21 Credit Hours.
Clinical observation of the practice of prosthetics and orthotics and related medical disciplines.

APPH 8000. Seminar. 3 Credit Hours.
The purpose of this course is for students to learn the research process from the early stage of identifying a question through publication of work.

APPH 8009. Research Seminar I. 1 Credit Hour.
A forum for graduate students in prosthetics and orthotics to present topics related to their research interests.

APPH 8010. Research Seminar II. 1 Credit Hour.
A forum for graduate students in prosthetics and orthotics to present and discuss topics related to their research interests.

APPH 8012. Research Seminar III. 3 Credit Hours.
A forum for graduate students in prosthetics and orthotics to present topics related to their research interests.

APPH 8801. Special Topics. 1 Credit Hour.
Topics of special interest not covered in the regular course offerings.

APPH 8802. Special Topics. 2 Credit Hours.
Topics of special interest not covered in the regular course offerings.

APPH 8803. Special Topics. 3 Credit Hours.
Topics of special interest not covered in the regular course offerings.

APPH 8804. Special Topics. 4 Credit Hours.
Topics of special interest not covered in the regular course offerings.

APPH 8813. Special Topics. 3 Credit Hours.
Topics of current interest not covered in other courses.

APPH 8823. Special Topics. 3 Credit Hours.
Topics of current interest not covered in other courses.

APPH 8833. Special Topics. 3 Credit Hours.
Topics of current interest not covered in other courses.

APPH 8901. Special Problems. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest.

APPH 8902. Special Problems. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest.

APPH 8903. Special Problems. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest.

APPH 8997. Teaching Assistantship. 1-21 Credit Hours.
This course if for students holding a graduate teaching assistantship.

APPH 8998. Research Assistantship. 1-9 Credit Hours.
For graduate students holding research assistantships.

APPH 9000. Doctoral Thesis. 1-21 Credit Hours.

Arabic (ARBC)

ARBC 1001. Elementary Arabic I. 4 Credit Hours.
Development of basic communication skills in the spoken language. Introduction to the writing system, the reading of simple texts, and basic grammatical structures.

ARBC 1002. Elementary Arabic II. 4 Credit Hours.
This is a course continuation of Arabic I.

ARBC 10X1. Trans Arabic Elementary I. 3 Credit Hours.

ARBC 10X2. Trans Arabic Elementary II. 3 Credit Hours.

ARBC 1501. Understanding Arab Culture. 3 Credit Hours.
Arab beliefs and values regarding topics such as religion, society, family, the dynamics between men and women, and social norms are discussed. Taught in English.

ARBC 1801. Special Topics. 1 Credit Hour.
Topics of current interest in Arabic.

ARBC 1813. Special Topics. 3 Credit Hours.
Topics of current interest in Arabic.

ARBC 1814. Special Topics. 4 Credit Hours.
Topics of current interest in Arabic.

ARBC 1823. Special Topics. 3 Credit Hours.
Special Topics for Arabic.

ARBC 1XXX. Arabic Elective. 1-21 Credit Hours.

ARBC 2001. Intermediate Arabic I. 3 Credit Hours.
This course continues the introduction to features of Arabic in the context of Arab culture at large. Students are exposed to features of several Arabic dialects.

ARBC 2002. Intermediate Arabic II. 3 Credit Hours.
This course is a continuation of ARBC 2001.

ARBC 2301. Arabic Arts, Science and Technology Through History. 3 Credit Hours.
An examination of Arab accomplishments in Sciences, Technology, Philosophy and Art (700-1300 AD) through historical documents, books and movies. Taught in English.

ARBC 2694. Internship Assistantship. 1-21 Credit Hours.
Modern Language Undergraduate Internship for pay for freshmen and sophomores, by permit only. The internship experience must be at a unit or agency approved by the School of Modern Language.

ARBC 2695. Undergraduate Internship. 1-21 Credit Hours.
Modern Language Undergraduate Internship for credit for freshmen and sophomores, by permit only. The internship experience must be at a unit or agency approved by the School of Modern Languages.

ARBC 2698. Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

ARBC 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

ARBC 2811. Special Topics. 1 Credit Hour.
Topics of current interest in Arabic.

ARBC 2813. Special Topics. 3 Credit Hours.
Topics of current interest in Arabic.

ARBC 2821. Special Topics. 2 Credit Hours.
Topics of current interest in Arabic.

ARBC 2823. Special Topics. 3 Credit Hours.
Topics of current interest in Arabic.

ARBC 2833. Special Topics. 3 Credit Hours.
Topics of current interest in Arabic.

ARBC 2XXX. Arabic Elective. 1-21 Credit Hours.

ARBC 3001. Advanced Arabic I. 3 Credit Hours.
Advanced grammar, listening, reading, writing, speaking, the language of contemporary Arabic society, politics and culture through task-based language teaching. Taught in Arabic.

ARBC 3002. Advanced Arabic II. 3 Credit Hours.
Listening, reading, writing, speaking the language of contemporary Arabic society, politics and culture through task-based language teaching. Taught in Arabic.

ARBC 3005. Contemporary Arab Culture. 3 Credit Hours.
This course covers topics in Contemporary Arab Culture in Modern Standard Arabic – such as news stories, cultural debates, contemporary movements, etc. Taught in Arabic.

ARBC 3401. Perspectives on the Arab-Israeli Conflict. 3 Credit Hours.
This course examines diverse perspectives on the Arab-Israeli conflict from literature, film, music, culture, and media in translation. No previous background required. Taught in English.

ARBC 3420. Introduction to Africa. 3 Credit Hours.
This interdisciplinary course will use a variety of approaches to study significant aspects of contemporary Africa's societies, cultures, and representations. Taught in English.

ARBC 3501. Men-Women In Islam. 3 Credit Hours.
The course discusses contemporary Arab women and men writers' interpretation of the Qur'an demonstrating the egalitarian and anti-patriarchal nature of its teachings. Taught in English.

ARBC 3691. Intensive Advanced Arabic. 3 Credit Hours.
Develops students' receptive & communicative skills in Arabic while capitalizing on the rich linguistic & cultural surroundings. Part of ARBC LBAT summer program.

ARBC 3692. Arabic for Business and Technology I. 3 Credit Hours.
The first sequence of two courses in which students learn the linguistic and pragmatic language of business culture in the Arab World. Taught in Arabic.

ARBC 3693. Arabic for Business and Technology II. 3 Credit Hours.
The continuation of two courses in which students learn the linguistic and pragmatic language of business culture in the Arab World. Taught in Arabic.

ARBC 3811. Special Topics. 1 Credit Hour.
Topics of current interest in Arabic.

ARBC 3812. Special Topics. 2 Credit Hours.
Topics of current interest in Arabic.

ARBC 3813. Special Topics. 3 Credit Hours.
Topics of current interest in Arabic.

ARBC 3823. Special Topics. 3 Credit Hours.
Topics of current interest in Arabic.

ARBC 3833. Special Topics. 3 Credit Hours.
Topics of current interest in Arabic.

ARBC 3XXX. Arabic Elective. 1-21 Credit Hours.

ARBC 4694. Internship Assistantship. 1-21 Credit Hours.
Modern Language Undergraduate Internship for pay for junior and seniors, by permit only. The internship experience must be at a unit or agency approved by the School of Modern Languages.

ARBC 4695. Arabic Internship. 1-3 Credit Hours.
Professional experience with a business/organization in which students enhance their language skills and cultural knowledge in Arabic in relation to the practical goals/objectives of the entity.

ARBC 4698. Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

ARBC 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

ARBC 4813. Special Topics. 3 Credit Hours.
Topics of current interest in Arabic.

ARBC 4823. Special Topics. 3 Credit Hours.
Topics of current interest in Arabic.

ARBC 4833. Special Topics. 3 Credit Hours.
Topics of current interest in Arabic.

ARBC 4901. Special Problems. 1-21 Credit Hours.
Special problems course for advanced students. Topics to be arranged with instructor.

ARBC 4902. Special Problems. 1-21 Credit Hours.
Special problems course for advanced students. Topics to be arranged with instructor.

ARBC 4XXX. Arabic Elective. 1-21 Credit Hours.

ARBC 8803. Special Topics. 3 Credit Hours.
Special Topics in Arabic Language and Literature.

ARBC 8804. Special Topics. 4 Credit Hours.
Special Topics in Arabic.

ARBC 8901. Special Problems in Arabic. 1-21 Credit Hours.
Provides the special instruction required under special programs.

ARBC 8902. Special Problems in Arabic. 1-21 Credit Hours.
Provides the special instruction required under special programs.

ARBC 8903. Special Problems in Arabic. 1-21 Credit Hours.
Provides the special instruction required under special programs.

Architecture (ARCH)

ARCH 1016. Foundation Studio 1. 4 Credit Hours.
Introduction to creative problem-solving and the design realization cycle through project-based design exercises that emphasize the role of representation.

ARCH 1017. Architecture Design Studio 1. 5 Credit Hours.
Introduction to the design of complex problems through an emphasis on integrative and collaborative design strategies, research , critical reflection, and interdisciplinary teamwork.

ARCH 1020. Media + Modeling 1. 3 Credit Hours.
Intermediate approaches to two and three dimensional modeling and representation in architecture using both manual and digital media and techniques.

ARCH 1060. Introduction to Design and the Built Environment. 3 Credit Hours.
Introduction to architecture and building construction through case studies that illuminate past and present practices, as well as future possibilities within the discipline.

ARCH 1854. Special Topics. 4 Credit Hours.
Special topics in design.

ARCH 1855. Special Topics. 5 Credit Hours.
Special Topics in design.

ARCH 1XXX. Architecture Elective. 1-21 Credit Hours.

ARCH 2016. Architecture Design Studio 2. 5 Credit Hours.
Elementary design exercises exploring fundamental issues of form and space through analysis of architectural elements and compositions and their use in creative problem solving.

ARCH 2017. Architecture Design Studio 3. 5 Credit Hours.
Elementary design exercises focusing upon the compositional integration of building and site through the creative assimilation of programmatic, technical, and contextual requirements.

ARCH 2020. Media + Modeling 2. 3 Credit Hours.
Advanced approaches to two and three dimensional modeling and representation in architecture using both manual and digital media and techniques.

ARCH 2111. History of Architecture I. 3 Credit Hours.
Architectural history from antiquity through the eighteenth century emphasizing buildings in their cultural context as informed by social, technological, and constructive factors and theoretical positions.

ARCH 2112. History of Architecture II. 3 Credit Hours.
Architectural history during the nineteenth and twentieth centuries emphasizing buildings in their cultural context as informed by social, technological, and constructive factors and theoretical positions.

ARCH 2115. Modern Architecture and Art in Europe, America and Australia: Nineteenth and Twentieth Centuries. 3 Credit Hours.
A brief survey of architecture and art in the nineteenth and twentieth centuries, including a discussion of related influences on developments in those fields.

ARCH 2211. Construction Technology and Design Integration I. 3 Credit Hours.
Introduction to building anatomy, technical and expressive characteristics of materials and their organizational assembly.

ARCH 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

ARCH 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

ARCH 2803. Special Topics. 3 Credit Hours.
Special Topics in design.

ARCH 2854. Special Topics. 4 Credit Hours.
Special Topics in design.

ARCH 2XXX. Architecture Elective. 1-21 Credit Hours.

ARCH 3000. REVIT. 3 Credit Hours.
Visualizing a form enhances a designer's ability to communicate ideas. Course will demonstrate how REVIT can facilitate the Conception of a design from various points of genesis.

ARCH 3007. Art & Architecture in Greece. 3 Credit Hours.
An intensive on-site investigation of the role that the arts and architecture have played in the development of classical Greek civilization.

ARCH 3008. Art & Architecture in Italy I. 3 Credit Hours.
Investigations of the painting, sculpture, and architecture of the Classical, Early Christian, Byzantine, and Medieval periods in Italy with special emphasis on Rome.

ARCH 3009. Art & Architecture in Italy II. 3 Credit Hours.
Investigations of the painting, sculpture, and architecture of the Renaissance and Baroque Periods in Italy with special emphasis on the works in Rome.

ARCH 3010. Design Strategies. 3 Credit Hours.
The design process as reflection in action. The logic of design decisions. The synthesis of diverse bodies of knowledge in design. Interdisciplinary collaborations in design.

ARCH 3016. Architecture Design Studio 4. 5 Credit Hours.
Intermediate architectural design projects emphasizing the functional priorities and expressive potential of building technologies through studio problems of varying programmatic and contextual complexity.

ARCH 3017. Architecture Design Studio 5. 5 Credit Hours.
Intermediate architectural design projects exploring the inter-relationships of various programmatic models, normative building types, and technological themes within specific physical, urban and cultural contexts.

ARCH 3115. Modern Arch and Art Workshop. 3 Credit Hours.
A brief survey of key ideas of architecture and art in the twenieth century and exploration of their application to current architectural design and representation.

ARCH 3116. Constructing the Visual. 3 Credit Hours.
Promote an understanding of visual representations as they pertain to art, architecture and the use of architecture representations in the structuring of persuasive statements/arguments.

ARCH 3135. City Literacy. 3 Credit Hours.
The course frames the city as material and social space, focusing on everyday experience in exemplary cities to explore how they are conceived and negotiated.

ARCH 3200. Portfolio Design. 3 Credit Hours.
Explores strategies of descriptions, representation, and presentation and other art-related ideas in order to communicate design work and design speculation effectively.

ARCH 3231. Environmental Systems and Design Integration I. 3 Credit Hours.
Human physiology, the occupation of space, and principles of sustainability. Micro-climate, energy consumption, thermal loading, passive solar strategies, daylighting, optics, and acoustics.

ARCH 3855. Special Topics. 5 Credit Hours.
Special Topics in design.

ARCH 3XXX. Architecture Elective. 1-21 Credit Hours.

ARCH 4015. Structures 1. 3 Credit Hours.
Gravity loads on building structures. Introduction to structural planning. Design of wood and steel structures. Properties of wood and architectural metals. Computer-based analysis of structures.

ARCH 4016. Architecture Design Studio 6. 5 Credit Hours.
Advanced studies in architectural design emphasizing application of analytical, conceptual, and representational skills within projects that engage and problematize urban context culturally, ecologically and technologically.

ARCH 4017. Architecture Design Studio 7. 6 Credit Hours.
Advanced studies in architectural design emphasizing application of analytical, conceptual, and representational skills within projects that engage and problematize urban context culturally, ecologically and technologically. Capstone Design Studio.

ARCH 4107. Introduction to Historic Preservation. 3 Credit Hours.
This course provides an overview of the history, philosophy, organization, current legislation, policies, and practice of historic preservation.

ARCH 4109. Architecture and Minimalism. 3 Credit Hours.
This course examines the influence of "minimalism," the 1960s art phenomenon, upon architecture culture and production from 1968-present.

ARCH 4110. Public Space: Questions and Configurations. 3 Credit Hours.
This course addresses questions concerning present-day configurations of public space as a platform for analysis of the contemporary city.

ARCH 4112. Architecture in Georgia. 3 Credit Hours.
A field study and archival research on the architecture of the state of Georgia outside of Atlanta.

ARCH 4118. American Academic Architecture. 3 Credit Hours.
Investigations of the history and theory of late nineteenth- and twentieth-century classicism in America.

ARCH 4120. Atlanta Architecture. 3 Credit Hours.
Investigations through lectures, reading, and research of the history of Atlanta architecture and significant architectural firms from the city's founding to the present.

ARCH 4123. European Modernism. 3 Credit Hours.
Survey of European architecture from Art Nouveau to LeCorbusier.

ARCH 4124. History of Architecture in the United States. 3 Credit Hours.
History investigations of architecture within the continental United States from the colonial period to the present.

ARCH 4127. Introduction to Art and Architecture in Italy. 1 Credit Hour.
Required preparation for the COA Summer Program in Italy. The course includes the fundamentals of art and architecture, basic Italian language skills, and library research for required summer program projects.

ARCH 4128. Barcelona: Architecture, Urban Design, Public Space. 3 Credit Hours.
Architectural history of the city of Barcelona and its public spaces, with a focus on the major urban and architectural projects since 1850. Offered through the Studies Abroad Program.

ARCH 4129. Form and Narrative: Cross Media Analysis. 3 Credit Hours.
This theory course will involve an extended comparison between architecture and related art forms, especially painting, film, and writing.

ARCH 4133. Architecture and Discourse of the Everyday. 3 Credit Hours.
Application of the concept of the everyday to architectural practice from perspectives of European social theory, American cultural landscape studies, and contemporary architectural theory.

ARCH 4137. Postwar Architecture and Urbanism in the U.S.: Design, Politics & History. 3 Credit Hours.
Introduction to the economic, social, political, cultural, and technological forces that shape architecture and cities in the United States after World War II.

ARCH 4140. Modern and Contemporary Architectual Theory and Criticism. 3 Credit Hours.
Introduction to modern and contemporary architectural theory and criticism, including writings and manifestoes, analyses, projects and buildings.

ARCH 4142. Dwelling: Histories and Theories of Enviornmental Behavior and Design. 3 Credit Hours.
Explores scholarship and case studies from multiple disciplines relating to issues of place, community identity and memory, culturally constructed meaning, and appropriate use of resources.

ARCH 4143. Museums: History, Theory, Design. 3 Credit Hours.
Investigates museums as manifestations of the construction and content of knowledge, the public mission of cultural and scientific institutions and the framing of visitors experience.

ARCH 4151. History of Urban Form. 3 Credit Hours.
History of the city as a collective work of architecture with an emphasis on the city's physical form and space. Credit not allowed for both ARCH 4151 and COA 6151.

ARCH 4225. Reinvestigating the Detail: The Ornamental and the Everyday. 3 Credit Hours.
Explores the role of the detail in contemporary architectural practice.

ARCH 4226. Green Construction. 3 Credit Hours.
This course focuses on the means, methods, strategies, and technologies to improve the energy efficiency and performance of buildings, and to reduce the environmental impact of buildings. Credit will not be awarded for both ARCH 4226 and ARCH 6226 or ARCH 4226 and BC 4710.

ARCH 4227. Architecture and Ecology. 3 Credit Hours.
Introduction to ecological design theory, research, and practice in architecture, including writings, criticism, and analyses of buildings and projects.

ARCH 4232. On Growth and Form. 3 Credit Hours.
Combination of aesthetic theory, history and digital design theory. The tracing of digital design (or generative design) back to its early roots in Romanticism.

ARCH 4240. Building Simulation in Design Practice. 3 Credit Hours.
Numerical simulation of performance of characteristics of whole buildings. Review of the finite element method for uniform treatment of transport phenomena in different building technology domains. Credit not awarded for both ARCH 4240 and ARCH 6241.

ARCH 4253. Advanced Structures Seminar. 3 Credit Hours.
Fundamentals of steel and concrete design and the computerized design of steel and concrete structural systems for multi-story buildings.

ARCH 4303. Programming and Building Evaluation. 3 Credit Hours.
Building programming and evaluation of building performance with respect to the aims of organizational users, policy development, and the process of planning and design decisions.

ARCH 4305. Near and Far: Cross-Cultural Practices in Art, Architecture and Design. 3 Credit Hours.
This course will address the material culture of globalization and cultural diffusion, emphasizing the multicultural registers of work produced between and across geographical, cultural, and disciplinary boundaries.

ARCH 4310. How do we dwell?. 3 Credit Hours.
Explores environmental behavior and the role of design in it through exploration of place and space, communal identity and memory, and natural and social ecology.

ARCH 4315. Professional Practice of Architecture. 3 Credit Hours.
Principles and framework of professional practice including ethics, legal climate, business practices and contracts, project process and management, office organization, and methods of building production.

ARCH 4316. Traditions of Architectural Practice. 3 Credit Hours.
Critical examination of architectural practice. Cultural derivation and technological transformation of various conventions of representation, construction, and design; speculation about future paradigms of architectural practice.

ARCH 4320. Retrofitting Suburbia. 3 Credit Hours.
Study of suburban redevelopment trends, projects, and policies that improve environmental, social, and economic sustainability, with an emphasis on urban design strategies. Credit not awarded for both ARCH 4320 and COA 6120.

ARCH 4334. Housing and Culture. 3 Credit Hours.
Examination of social, cultural, and behavioral issues as they influence the form of houses and housing.

ARCH 4335. The Social Practice of Architecture. 3 Credit Hours.
Introduction to theories and findings about human use and experience of architecture.

ARCH 4350. Architectural Theory. 3 Credit Hours.
A critical perspective on the topics, voices, and texts that have dominated architectural discourse in the West.

ARCH 4410. Collage Making. 3 Credit Hours.
Concepts of Collage within art, architecture, and culture, manual and electronic approaches to two and three-dimensional collage-making.

ARCH 4411. Introduction to Visual Arts. 3 Credit Hours.
Orientation to issues of visual perception and representation of form and space through freehand drawing, composition, color, texture, mixed-media, and journal making.

ARCH 4412. Drawing and the Human Figure. 3 Credit Hours.
Studio instruction in figure drawing from the live model with emphasis on the structure and dynamics of the human figure.

ARCH 4413. Collage Making. 3 Credit Hours.
Concepts of collage within art, architecture, and culture; manual and electronic approaches to two and three-dimensional collage making.

ARCH 4414. Representation in Watercolor. 3 Credit Hours.
Introductory course in the use of transparent watercolor for field painting and architectural representation. Theory of pigment characteristics in applied painting.

ARCH 4415. Photography I. 3 Credit Hours.
Introduction to studio, darkroom, and field photography with emphasis on composition, processing, and printing.

ARCH 4416. Photography II. 3 Credit Hours.
Advanced techniques in photography. Use of color, filters, four-by- five format cameras with emphasis on architectural photography.

ARCH 4417. Building Furniture and Furnishing Buildings. 3 Credit Hours.
A course that focuses on schematic design development of furniture. The emphasis of this course is on conceptual development and material and structural clarity.

ARCH 4447. Urban Ecological Design. 3 Credit Hours.
This course engages the contemporary issues of urban ecology and its articulation to design. It explores relationship between urban forms and flows of ecology, energy, material, water and information. Credit will not be awarded for both ARCH 4447 and ARCH 6447 or ARCH 4447 and CP 6836.

ARCH 4503. BIM (Building Information Modeling) Applications. 3 Credit Hours.
Survey of Building Information Modeling - its technologies exploration of new technologies to be applied and new procedures of project execution. Credit is not awarded for both ARCH 4503 and ARCH 6503.

ARCH 4505. Geometric Constructs. 3 Credit Hours.
Geometric surface and solid construction fundamentals using parametric modeling tools; use of sketching workbenches. Credit will not be awarded for both ARCH 4505 and ARCH 6505.

ARCH 4507. Parametric Design. 3 Credit Hours.
Exploration of concepts and mechanisms for creating custom parametric models that use hierarchies of relationships, constraints and rules for architectural components through parameters. Credit not awarded for both ARCH 4507 and ARCH 6507.

ARCH 4508. Shape Grammars. 3 Credit Hours.
Shape grammars are a powerful formal system for the generative description, interpretation and evaluation of designs. Credit will not be awarded for both ARCH 4508 and ARCH 6508.

ARCH 4510. Advanced Productions. 3 Credit Hours.
Advanced integration of digital design and production technologies through Mixed Reality (MR) geared towards collaborative immersive spatial design and production systems.

ARCH 4515. Collaborative Design Workshop. 3 Credit Hours.
Collaborative Design Workshop provides a platform for students to participate in a "live project" that requires them to navigate external relationships and constraints as part of the design process.

ARCH 4630. Architecture, Space and Culture. 3 Credit Hours.
Analytical models of the social functions of architectural space and evaluation of associated design choices, across a variety of building types.

ARCH 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

ARCH 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

ARCH 4701. Analog-Digital Design Computing. 3 Credit Hours.
Analog and digital approaches in design computation. Visual and symbolic representations. Algorithmic and computational tools. History and logic. Credit will not be awarded for both ARCH 4701 and ARCH 6501.

ARCH 4702. Design Scripting. 3 Credit Hours.
Learning the concepts and application of scripting languages in architecture and form generation. Credit will not be awarded for both ARCH 4702 and ARCH 6502.

ARCH 4770. Psychology and Environmental Design. 3 Credit Hours.
Introduction to psychological concepts relevant to environmental design. Survey of selected methods for assessing human-made environments. Crosslisted with PSYC 4770.

ARCH 4801. Special Topics. 1 Credit Hour.

ARCH 4802. Special Topics. 2 Credit Hours.

ARCH 4803. Special Topics. 3 Credit Hours.

ARCH 4804. Special Topics. 4 Credit Hours.

ARCH 4805. Special Topics. 5 Credit Hours.

ARCH 4811. Special Topics: Architectural Design. 1 Credit Hour.

ARCH 4812. Special Topics: Architectural Design. 2 Credit Hours.

ARCH 4813. Special Topics: Architectural Design. 3 Credit Hours.

ARCH 4814. Special Topics: Architectural Design. 4 Credit Hours.

ARCH 4815. Special Topics: Architectural Design. 5 Credit Hours.

ARCH 4821. Special Topics: History, Theory, and Criticism. 3 Credit Hours.

ARCH 4822. Special Topics: History, Theory, and Criticism. 3 Credit Hours.

ARCH 4823. Special Topics: History, Theory, and Criticism. 3 Credit Hours.

ARCH 4831. Special Topics: Architectural Technology. 3 Credit Hours.

ARCH 4832. Special Topics: Architectural Technology. 3 Credit Hours.

ARCH 4833. Special Topics: Architectural Technology. 3 Credit Hours.

ARCH 4841. Special Topics: Professional and Social Practice. 3 Credit Hours.

ARCH 4842. Special Topics: Professional and Social Practice. 3 Credit Hours.

ARCH 4843. Special Topics: Professional and Social Practice. 3 Credit Hours.

ARCH 4851. Special Topics: Visual Arts and Computing. 1 Credit Hour.

ARCH 4852. Special Topics: Visual Arts and Computing. 2 Credit Hours.

ARCH 4853. Special Topics: Visual Arts and Computing. 3 Credit Hours.

ARCH 4855. Special Topics. 5 Credit Hours.
Special topics in design.

ARCH 4863. Special Topics. 3 Credit Hours.
Topics of current interest in architecture.

ARCH 4901. Special Problems. 1-21 Credit Hours.

ARCH 4902. Special Problems. 1-21 Credit Hours.

ARCH 4903. Special Problems. 1-21 Credit Hours.

ARCH 4904. Special Problems. 1-21 Credit Hours.

ARCH 4905. Special Problems. 1-21 Credit Hours.

ARCH 4911. Special Problems: Architectural Design. 1-21 Credit Hours.

ARCH 4912. Special Problems: Architectural Design. 1-21 Credit Hours.

ARCH 4913. Special Problems: Architectural Design. 1-21 Credit Hours.

ARCH 4914. Special Problems: Architectural Design. 1-21 Credit Hours.

ARCH 4915. Special Problems: Architectural Design. 1-21 Credit Hours.

ARCH 4921. Special Problems: History, Theory, and Criticism. 1-21 Credit Hours.

ARCH 4922. Special Problems: History, Theory, and Criticism. 1-21 Credit Hours.

ARCH 4923. Special Problems: History, Theory, and Criticism. 1-21 Credit Hours.

ARCH 4931. Special Problems: Architectural Technology. 1-21 Credit Hours.

ARCH 4932. Special Problems: Architectural Technology. 1-21 Credit Hours.

ARCH 4933. Special Problems: Architectural Technology. 1-21 Credit Hours.

ARCH 4941. Special Problems: Professional and Social Practice. 1-21 Credit Hours.

ARCH 4942. Special Problems: Professional and Social Practice. 1-21 Credit Hours.

ARCH 4943. Special Problems: Professional and Social Practice. 1-21 Credit Hours.

ARCH 4951. Special Problems: Visual Arts and Design Computing. 1-21 Credit Hours.

ARCH 4952. Special Problems: Visual Arts and Design Computing. 1-21 Credit Hours.

ARCH 4953. Special Problems: Visual Arts and Design Computing. 1-21 Credit Hours.

ARCH 4XXX. Architecture Elective. 1-21 Credit Hours.

ARCH 6000. REVIT. 3 Credit Hours.
Visualizing a form enhances a designer's ability to communicate ideas. Course will demonstrate how REVIT can facilitate the Conception of a design from various points of genesis.

ARCH 6007. Art & Architecture in Greece. 3 Credit Hours.
An intensive on-site investigation of the role that the arts and architecture have played in the development of classical Greek civilization.

ARCH 6008. Art & Architecture in Italy I. 3 Credit Hours.
Investigations of the painting, sculpture, and architecture of the Classical, Early Christian, Byzantine, and Medieval periods in Italy with special emphasis on Rome.

ARCH 6009. Art & Architecture in Italy II. 3 Credit Hours.
Investigations of the painting, sculpture, and architecture of the Renaissance and Baroque periods in Italy with special emphasis on the works of Rome.

ARCH 6010. Media + Modeling 1. 3 Credit Hours.
Introductory approaches to two and three dimensional modeling and representation in architecture using both manual and digital media and techniques.

ARCH 6015. Structures 1. 3 Credit Hours.
This course provides students with a basic knowledge of analysis and design of building structures and the ordering of structural systems to resist gravity and lateral loads.

ARCH 6020. Media + Modeling 2. 3 Credit Hours.
Intermediate approaches to two dimensional modeling and representation in architecture using both manual and digital media techniques.

ARCH 6024. Architecture Core I Studio. 5 Credit Hours.
Foundation studies in architectural design emphasizing enalytical and analogical generative strategies applied to studio problems that engage architectural representation, composition, and fabrication. Credit not allowed for both ARCH 6024 and ARCH 4021.

ARCH 6026. Architecture Core II Studio. 5 Credit Hours.
Intermediate studies in architectural design emphasizing integrative design strategies that engage the programmatic, contextual, and constructed dimentions of architecure and its representations. Credit not allowed for both ARCH 6026 and ARCH 4022.

ARCH 6027. Architecture Core III Studio. 5 Credit Hours.
Intermediate studies in architectural design emphasizing integrative design strategies that engage the programmatic, contextual, and constructed dimensions of architecture and its representations. Credit not allowed for both ARCH 6027 and ARCH 4023.

ARCH 6028. Core 1 Studio. 5 Credit Hours.
Foundation studies in architectural design emphasizing analytical and analogical generative strategies applied to studio problems that engage architectural representation, composition, and fabrication.

ARCH 6029. Core 2 Studio. 5 Credit Hours.
Intermediate studies in architectural design emphasizing integrative design strategies that engage the programmatic, contextual, and constructed dimensions of architecture and its representations.

ARCH 6030. Core 3 Studio. 5 Credit Hours.
Intermediate studies in architectural design emphasizing integrative design strategies that engage the programmatic, contextual, and constructed dimensions of architecture and its representations.

ARCH 6039. Advanced Architectural Studio 1. 6 Credit Hours.
Architectural design studio exploring advanced issues in architecture from the perspectives of professional practice, sustainability, technology and urban design.

ARCH 6040. Advanced Architectural Studio 2. 6 Credit Hours.
Architectural design studio exploring advanced issues in architecture from the perspectives of professional practice, sustainability, technology and urban design.

ARCH 6049. Design + Research Studio 1. 6 Credit Hours.
Advanced architectural design emphasizing innovation through applied research. Emerging methods of design generation/evaluation. Changing topics: healthcare, fabrication, urbanism, ecology, building performance, cultural institutions.

ARCH 6050. Design + Research Studio 2. 6 Credit Hours.
Advanced architectural design emphasizing innovation through applied research. Emerging methods of design generation/evaluation. Changing topics: healthcare, fabrication, urbanism, ecology, building performance, cultural institutions.

ARCH 6069. Advanced Architectural Design I. 6 Credit Hours.
Architectural design studio exploring advanced issues in architecture from the perspectives of professional practice, sustainability, technology and urban design.

ARCH 6070. Advanced Architectural Design II. 6 Credit Hours.
Architectural design studio exploring advanced issues in architecture from the perspectives of professional practice, sustainability, technology and urban design.

ARCH 6071. Architecture Design and Research Studio I. 6 Credit Hours.
Advanced architectural design emphasizing innovation through applied research. Emerging methods of design generation/evaluation. Changing topics: healthcare, fabrication, urbanism, ecology, building performance, cultural institutions.

ARCH 6072. Architectural Design and Research Studio 2. 6 Credit Hours.
Advanced architectural design emphasizing innovation through applied research. Emerging methods of design generation/evaluation. Changing topics: healthcare, fabrication, urbanism, ecology, building performance, cultural institutions.

ARCH 6100. Retrofitting Suburbia. 3 Credit Hours.
Study of suburban redevelopment trends, projects, and policies that improve environmental, social, and economic sustainability, with an emphasis on urban design strategies.

ARCH 6105. Architectural History I - Antiquity through the 18th Century. 3 Credit Hours.
Architectural history from aniquity through the 18th century emphasizing buildings in their cultural context as informed by social, technological, and constructive factors and theoretical positions. Credit not allowed for both ARCH 6105 and ARCH 4105 or ARCH 2111.

ARCH 6106. Architectural History II - 19th and 20th Century. 3 Credit Hours.
Architectural history during the 19th and 20th centuries emphasizing buildings in their cultural context as informed by social, technological, and constructive factors and theoretical positions. Credit not allowed for both ARCH 6106 and ARCH 4106 or ARCH 2112.

ARCH 6107. Intro to Historic Preser. 3 Credit Hours.
This course provides an overview of the history, philosophy, organization, current legislation, policies, and practice of historic preservation.

ARCH 6109. Architecture and Minimalism. 3 Credit Hours.
This course examines the influence of "minimalism," the 1960s art phenomenon, upon architecture culture and production from 1968-present.

ARCH 6110. Public Space: Questions and Configurations. 3 Credit Hours.
This course addresses questions concerning present-day configurations of public spaces as a platform for analysis of the contemporary city.

ARCH 6112. Islamic Architecture and Urbanism. 3 Credit Hours.
Two-part survey of Asian architecture and urbanism (excluding East Asia). The Islamic world up to the 18th century: the Mughal, Raj, and post-independence periods in Indian subcontinent.

ARCH 6113. History of Renaissance and Mannerist Architecture. 3 Credit Hours.
Investigation of the history and theory of Renaissance and Mannerist architecture with a primary emphasis on Italy.

ARCH 6114. Architecture and Discourse of the Everyday. 3 Credit Hours.
Application of the concept of the everyday to architectural practice from perspectives of European social theory, American cultural landscape studies, and contemporary architectural theory.

ARCH 6115. Introduction to Principles of Classical Design. 3 Credit Hours.
An introduction to the principles of Classical and traditional architectural design through readings, discussions, and site visits with Classical architects.

ARCH 6117. Architecture of the Arts and Crafts Movement. 3 Credit Hours.
Study of the theory, design, and construction of the "artistic" house as embodied in the English and American Arts and Crafts Movement and in related developments elsewhere.

ARCH 6119. Frank Lloyd Wright and His Influence. 3 Credit Hours.
Study of the life, work, and influence of Frank Lloyd Wright, including work of his apprentices and followers.

ARCH 6120. History of Atlanta Architecture. 3 Credit Hours.
Study of the architecture of the Atlanta metro area.

ARCH 6127. Introduction to Art and Architecture in Italy. 1 Credit Hour.
Required preparation for the COA Summer Program in Italy. Includes the fundamentals of art and architecture; basic Italian language skills; library research for required summer program projects.

ARCH 6129. Form and Narrative: Cross Media Analysis. 3 Credit Hours.
This theory course will involve an extended comparison between architecture and related art forms, especially painting, film, and writing.

ARCH 6135. Architectural Representation. 3 Credit Hours.
Systems of architectural representation and codes of thinking, drawing, and reading architecture.

ARCH 6136. Architecture and Ideology. 3 Credit Hours.
Architecture and politics in Italy, Germany, and the Soviet Union between the wars.

ARCH 6137. Postwar Architecture and Urbanism in the U.S.: Design, Politics & History. 3 Credit Hours.
Introduction to the economic, social, political, cultural, and technological forces that shape architecture and cities in the United States after World War II.

ARCH 6142. Dwelling: Histories and Theories of Environmental Behavior and Design. 3 Credit Hours.
Explores scholarship and case studies from multiple disciplines relating to issues of place, community identity and memory, culturally contstructed meaning, and appropriate use of resources.

ARCH 6143. Museums: History, Theory, Design. 3 Credit Hours.
Investigates museums as manifestations of the construction and content of knowledge, the public mission of cultural and scientific institutions and the framing of visitors experience.

ARCH 6151. Theories of Urban Design. 3 Credit Hours.
Contemporary theories of urban design and their relationship to the contemporary city examined through architects' writings, urban projects, and interdisciplinary criticism.

ARCH 6152. Studies in Landscape Architecture. 3 Credit Hours.
History and theory of the designed landscape and garden from the ancient world to the present.

ARCH 6153. History and Theory of the Modern City. 3 Credit Hours.
An examination of the evolution of the modern city in the nineteenth and twentieth centuries with particular reference to architectural, city planning, and urban design theories.

ARCH 6154. Introduction to Urban Design. 3 Credit Hours.
Introduction of urban design ideas, research, and practice, examining traditional qualities of the American city and their possible applications in the contemporary city.

ARCH 6155. Contemporary Architecture and Urbanism in Europe. 3 Credit Hours.
A course on contemporary architecture and urban projects in Europe, including the architect's writings, published criticism, and analyses of the buildings and projects.

ARCH 6160. Race, Space, and Architecture in the United States. 3 Credit Hours.
This course examines the relationship between architecture - as social practice and as a labor market - and race in the United States.

ARCH 6171. Formulation of Design Intention in Architecture. 3 Credit Hours.
Reviews theories of interpretive criticism in architecture, and develops methodological approaches to interpreting criticizing, and formulating conceptual intent in architectural design.

ARCH 6200. Portfolio Design. 3 Credit Hours.
Explores strategies of descriptions, representation, and presentation and other art-related ideas in order to communicate design work and design speculation effectively.

ARCH 6206. Studies in Architectural Building Assemblies. 3 Credit Hours.
Structural and cladding systems integration, environmental control, and tectonic representation explored through historical and contemporary case studies and applied design solutions.

ARCH 6209. Building Enclosure: A Tectonic Element. 3 Credit Hours.
Investigations of enclosure design from three perspectives (technology, form, and culture), analyzing relationships of the four Semperian elements and Alberti's three parts of the enclosure.

ARCH 6210. Architectonics. 3 Credit Hours.
The study of architecture of form from both an historical and a mathematical perspective. The formal theory is applied mathematics, group theory, combinatroics, as well as recent studies in the history of mathematics.

ARCH 6215. Contemporary Architecture and Construction Technology. 3 Credit Hours.
General exposure to questions pertaining to the production of building systems and assemblies through a series of case study projects by contemporary practicing architects.

ARCH 6216. Eco-Tectonics: Making and Meaning. 3 Credit Hours.
Strategies of ecologically sustainable design and construction and the role of the architect in the stewardship of the environment.

ARCH 6218. The Material Logic of Architecture. 3 Credit Hours.
Introduction to scientific and practical nature of architectural materials: soils, cements, metals, plastics, and glazing materials. Laboratory includes fabrication of, and experiments on, architectural materials.

ARCH 6225. Reinvestigating the Detail: The Ornamental and the Everyday. 3 Credit Hours.
Explores the role of the detail in contemporary architectural practice.

ARCH 6226. Green Construction. 3 Credit Hours.
This course focuses on the means, methods, strategies, and technologies to improve the energy efficiency and performance of buildings, and to reduce the environmental impact of buildings.

ARCH 6227. Architecture and Ecology. 3 Credit Hours.
Introduction to ecological design theory, research, and practice in architecture, including writings, criticism, and analyses of buildings and projects.

ARCH 6228. Analytical Investigations in Urban Design. 3 Credit Hours.
Measures of urban and spatial form. Analysis of street connectivity. Models of space use and spatial congnition. Comparison and evaluation of design alternatives.

ARCH 6229. Construction Technology and Design Integration I. 3 Credit Hours.
Introduction to building anatomy, technical and expressive characteristics of materials and their organizational assembly. Credit not allowed for both ARCH 6229 and ARCH 4219.

ARCH 6241. Building Simulation in Design Practice. 3 Credit Hours.
Learn to use mainstream simulation packages to support building design in domains of Energy, CFD, Lighting, Ventilation.

ARCH 6242. Building Physics Modeling. 3 Credit Hours.
Survey of basic thermo-fluid energy and mass flows in buildings, the interrelations between these flows, physical system modeling, and implications for building performance goals.

ARCH 6243. Evidence-Based Design. 3 Credit Hours.
Fundamental concepts, research methods and case studies of evidence-based design.

ARCH 6251. Building Structures I. 3 Credit Hours.
Introduction to design and analysis of building structures and ordering of structural systems to resist gravity and lateral loads. Emphasis on wood structures.

ARCH 6252. Building Structures II. 3 Credit Hours.
Introduction to structural design and framing systems for steel and concrete with consideration of lateral loads and lateral load resisting systems.

ARCH 6268. Advanced Architecture, Culture and Behavior: Theories, Models and Methods. 3 Credit Hours.
Theories, models, methods and case studies linking architectural design to culture and behavior.

ARCH 6271. Healthcare Design of the Future. 3 Credit Hours.
Introduction to research-based approaches to integrated healthcare design innovation.

ARCH 6303. Urban Design: Policy and Implementation. 3 Credit Hours.
Introduction to urban design policy and practice across a range of scales including planning, architecture, landscape architecture, civil engineering, public policy and administration. Credit not allowed for both ARCH 6303 and CP 6834.

ARCH 6305. Near and Far: Cross-Cultural Practices in Art, Architecture, and Design. 3 Credit Hours.
This course will address the material culture of globalization and cultural diffusion, emphasizing the multicultural registers of work produced between and across geographical, cultural, and disciplinary boundaries.

ARCH 6312. Ecological Practice: History, Polemics, and Poetics. 3 Credit Hours.
An historically and culturally grounded examination of the ecological perspective. Critical and productive engagement with green guidelines, laws, products, design briefs, and procedures.

ARCH 6313. Traditions of Architectural Practice. 3 Credit Hours.
Critical examination of architectural practice. Cultural derivation and technological transformation of various conventions of representation, construction, and design; speculations about future paradigms of architectural practice.

ARCH 6315. Practice of Architecture I. 3 Credit Hours.
Architectural practice from historical, sociological, and ethical perspectives with focus on professional leadership, practice management, and entrepreneurship.

ARCH 6316. Practice of Architecture 2. 3 Credit Hours.
Methods of architectural project delivery and project management. Fundamentals of building economics. Emergent models of research-driven architectural practice.

ARCH 6350. Theory of Architecture I. 3 Credit Hours.
Architectural program. Building types from functional and morphological perspectives. Design responses to building programs in the context of culture and politics. Architectural responses to site.

ARCH 6352. Theory of Architecture 2. 3 Credit Hours.
Approaches to architectural form, style, and tectonics from aesthetic, social, and technological perspectives. Instrumental and symbolic uses of architectural media in design and building production.

ARCH 6404. Electronic Media: From Technique to Culture. 3 Credit Hours.
The influence of electronic media upon representation and invention in architecture.

ARCH 6410. Collage Making. 3 Credit Hours.
Concepts of Collage within art, architecture, and culture, manual and electronic approaches to two and three-dimensional collage-making.

ARCH 6412. Dwelling: Histories and Theories of Environmental Behavior and Design. 3 Credit Hours.
Explores scholarship and case studies from multiple disciplines relating to issues of place, community identity and memory, culturally constructed meaning, and appropriate use of resources.

ARCH 6417. Building Furniture/Furnishing Buildings. 3 Credit Hours.
A course that focuses on schematic design and design development of furniture. The emphasis of this course is on conceptual and material/structural clarity.

ARCH 6420. Design Computing. 3 Credit Hours.
Survey of computer representations and modeling techniques, including pixel-based images, vector-based drawing systems, and surface and solid modeling; use of applications built upon these systems. Credit not allowed for both ARCH 6420 and ARCH 4420.

ARCH 6426. 3D Modeling in Architecture. 3 Credit Hours.
Construction of 3D computer models of architectural structures. Topics include: geometry creation, light and materials property, rendering, data exchange, and basic animation.

ARCH 6427. Advanced Modeling and Animation in Architecture. 3 Credit Hours.
Advanced computer modeling of architectural form. Topics include: parametric design, parametric materials, special effects, object libraries, animation, and video production.

ARCH 6428. Formal Systems in Design, Art, and Architecture. 3 Credit Hours.
This course will examine generative descriptions of languages of design, art, and architecture and explore various computational approaches to design with a special emphasis on shape grammars.

ARCH 6447. Urban Ecological Design. 3 Credit Hours.
This course engages the contemporary issues of urban ecology and its articulation to design. It explores relationship between urban forms and flows of ecology, energy, material, water and information. Credit not allowed for both ARCH 6447 and CP 6836.

ARCH 6470. Architecture Modeling & Media I. 3 Credit Hours.
Introductory approaches to two and three dimensional modeling and representation in architecture using both manual and digital media and techniques.

ARCH 6472. Architecture Modeling & Media 2. 3 Credit Hours.
Intermediate approaches to two dimensional modeling and representation in architecture using both manual and digital media and techniques.

ARCH 6474. Architecture Modeling & Media 3. 3 Credit Hours.
Advanced approaches to two and three dimensional modeling and representation in architecture using both manual and digital media and techniques.

ARCH 6501. Analog and Digital Design Computation. 3 Credit Hours.
Analog and digital approaches in design computation. Visual and symbolic representations. Algorithmic and computational tools. History and logic.

ARCH 6502. Scripting for Architecture and Design. 3 Credit Hours.
Learning the concepts and application of scripting languages in architecture and form generation.

ARCH 6503. Building Information Modeling - Concepts and Applications. 3 Credit Hours.
Survey of Building Information Modeling - its technologies exploration of new technologies to be applied and new procedures of project execution.

ARCH 6504. Digital Design and Fabrication Workshop. 6 Credit Hours.
Parametric design, planning and programming. Develop design for fabrication in specific materials including wood, plastic, metals, concrete, or composite.

ARCH 6505. Geometric Constructs in Digital Space. 3 Credit Hours.
Geometric surface and solid construction fundamentals using parametric modeling tools; use of sketching workbenches.

ARCH 6506. Construction Materials, Systems, and Fabrications. 3 Credit Hours.
Physical and constructional properties of building materials. Fabrication techniques for building components. Digital representations of materials, components, and fabrication processes.

ARCH 6507. Parametric Modeling and Design. 3 Credit Hours.
Design using parametric modeling tools; use of sketching workbenches and development of custom parametric models.

ARCH 6508. Shape Grammars. 3 Credit Hours.
Shape grammars are a powerful formal system for the generative description, interpretation and evaluation of designs.

ARCH 6509. Computation, Creativity and Design Cognition. 3 Credit Hours.
This course investigates computational methods, models tools that support design creativity and cognition. Credit not allowed for both ARCH 6509 and ID 6509.

ARCH 6510. Advanced Productions. 3 Credit Hours.
Advanced integration of digital design and production technologies through Mixed Reality (MR) geared towards collaborative immersive spatial design and production systems.

ARCH 6511. Robotic Fabrication. 3 Credit Hours.
Introduction to robotics in design and construction. Kinematics and programing of 6-axis industrial robots. Use of robotics in building fabrication and assembly operations.

ARCH 6512. Research Colloquium. 3 Credit Hours.
Introduces students to the processes of developing a topic of inquiry and delivering projects in architectural design, and to prepare students for the development of a final MS research project to be delivered as a final deliverable of the MS program during the subsequent semester.

ARCH 6513. Building Systems & Data. 3 Credit Hours.
A focus on the overlap between AEC (Architecture, Engineering, Construction) processes and the building models and data that support them.

ARCH 6531. Environmental Systems I. 3 Credit Hours.
Basics of heat, light, and sound applied to buildings. Thermal loading, passive thermal control, thermal comfort, climate, passive solar strategies, light and daylighting, acoustics.

ARCH 6731. Zero Energy House. 3 Credit Hours.
Design, analysis, operation, construction, and cost feasibility of so-called "zero energy" houses. Credit not allowed for both ARCH 6731 and BC 6731.

ARCH 6XXX. Architecture Elective. 1-21 Credit Hours.

ARCH 7000. Master's Thesis. 1-21 Credit Hours.

ARCH 7012. Urban Design Studio I. 6 Credit Hours.
Urban design laboratory problems focusin on analysis, design, and implementation strategies for contemporary urban problems.

ARCH 7013. Urban Design Studio 1. 6 Credit Hours.
Urban design studio problems focusing on analysis, design, and implementation strategies for contemporary urban problems.

ARCH 7014. Urban Design Studio 2. 6 Credit Hours.
Advanced urban design problems emphasizing the application of contemporary urban design research and multidisciplinary collaboration into the design process.

ARCH 7015. Urban Design Studio 3. 6 Credit Hours.
Advanced urban design problems emphasizing the application of contemporary urban design research and multidisciplinary collaboration into the design process.

ARCH 7030. Media + Modeling 3. 3 Credit Hours.
Advanced approaches to two and three dimensional modeling and representation in architecture using both manual and digital media and techniques.

ARCH 7042. Urban Design Workshop. 3 Credit Hours.
Advanced problems in urban design and development focusing on the Atlanta region. Integration of urban design theory and methods, economic development, political registration, and communication.

ARCH 7043. Urban Design Workshop. 4 Credit Hours.
Advanced problems in urban design and development focusing on the Atlanta region. Integration of urban design theory and methods, economic development, political registration, and communication.

ARCH 7044. Urban Design Workshop. 5 Credit Hours.
Advanced problems in urban design and development focusing on the Atlanta region. Integration of urban design theory and methods, economic development, political registration, and communication.

ARCH 7045. Urban Design Workshop. 6 Credit Hours.
Advanced problems in urban design and development focusing on the Atlanta region. Integration of urban design theory and methods, economic development, political registration, and communication.

ARCH 7060. Critical Positions in Architectural Design. 3 Credit Hours.
Advanced topics in the theory of architectural production focusing upon contemporary ethical dilemmas and the development of critical positions of design.

ARCH 7101. Integrated Building Systems 1. 3 Credit Hours.
Examines approaches to building design and systems integration. Introduces resiliency as a means of integrating environmental assessment for energy efficiency and design for natural forces.

ARCH 7102. Integrated Building Systems II. 3 Credit Hours.
Approaches building design and systems integration through the making of construction drawings and specifications of metal frame buildings, including structural steel calculations.

ARCH 7103. Integrated Building Systems III. 3 Credit Hours.
Approaches building design and systems integration via the design and detailing of a concrete frame building, including engineering of the concrete frame and the mechanical systems.

ARCH 7116. Constructing the Visual. 3 Credit Hours.
Promote an understanding of visual representations as they pertain to art, architecture and the use of architecture representations in the structuring of persuasive statements/arguments.

ARCH 7151. History of Urban Form. 3 Credit Hours.
History of the city as a collective work of architecture with an emphasis on the city's physical form and space.

ARCH 7155. Flourishing Communities. 3 Credit Hours.
Introduces students to collaborative and participatory processes especially in relation to design, equity, diversity, and inclusion for underserved communities.

ARCH 7252. Computational Building Simulation. 3 Credit Hours.
Students learn how to develop their own extensible Building Simulation software using Finite Element discretization in Matlab and apply it to research problem.

ARCH 7350. Foundations of Architectural Theory. 3 Credit Hours.
Reviews thought and attitudes guiding architecture since the modern movement, their philosophical sources, and their relationship with architectural production. Defines architectural theory.

ARCH 7360. Design & Climate Change. 3 Credit Hours.
This course positions design as an essential component of research that explores the sociocultural and eco-political dimensions of climate change as it applies to the built environment.

ARCH 7471. Cognitive Function of Visual Design in Architecture. 3 Credit Hours.
Presents fundamentals of imaginative and cognitive functioning of visual design in buildings, and develops inter-disciplinary approaches to investigating visual form of buildings.

ARCH 7625. Theories of Inquiry. 3 Credit Hours.
Introduction to research paradigms and their assumptions. The formulation of questions and frameworks of description, representation, analysis, interpretation, and data control.

ARCH 8100. Introduction to Architectural Research 1. 3 Credit Hours.
Fundamental issues and methods across specializations in architectural research modules on causation and simulation.

ARCH 8101. Introduction to Architectural Research 2. 3 Credit Hours.
Fundamental issues and methods across specializations in architectural research; modules on representation and interpretation.

ARCH 8102. Introduction to Architectural Research 3. 3 Credit Hours.
Fundamental issues and methods across specializations in architectural research; modules on historiography and epistemology and on theories of design.

ARCH 8630. Architecture Space & Culture. 3 Credit Hours.
Accounts of the social functions of architectural space and associated design choices, across a variety of building types and scales of environmental design.

ARCH 8685. Building Simulation Seminar. 3 Credit Hours.
Numerical simulation of performance characteristics of whole buildings. Review of the finite element method for uniform treatment of transport phenomena in different building technology domains.

ARCH 8799. Qualifying Paper. 1-21 Credit Hours.
Preparation for Qualifying Paper in Doctorial Program in Architecture.

ARCH 8801. Special Topics. 1 Credit Hour.

ARCH 8802. Special Topics. 2 Credit Hours.

ARCH 8803. Special Topics. 3 Credit Hours.

ARCH 8804. Special Topics. 4 Credit Hours.

ARCH 8805. Special Topics. 5 Credit Hours.

ARCH 8806. Special Topics. 6 Credit Hours.

ARCH 8811. Special Topics: Architectural Design. 1 Credit Hour.

ARCH 8812. Special Topics: Architectural Design. 2 Credit Hours.

ARCH 8813. Special Topics: Architectural Design. 3 Credit Hours.

ARCH 8814. Special Topics: Architectural Design. 4 Credit Hours.

ARCH 8815. Special Topics: Architectural Design. 5 Credit Hours.

ARCH 8821. Special Topics: History, Theory, and Criticism. 3 Credit Hours.

ARCH 8822. Special Topics: History, Theory, and Criticism. 3 Credit Hours.

ARCH 8823. Special Topics: History, Theory, and Criticism. 3 Credit Hours.

ARCH 8831. Special Topics: Architectural Technology. 3 Credit Hours.

ARCH 8832. Special Topics: Architectural Technology. 3 Credit Hours.

ARCH 8833. Special Topics: Architectural Technology. 3 Credit Hours.

ARCH 8841. Special Topics: Professional and Social Practice. 3 Credit Hours.

ARCH 8842. Special Topics: Professional and Social Practice. 3 Credit Hours.

ARCH 8843. Special Topics: Professional and Social Practice. 3 Credit Hours.

ARCH 8851. Special Topics: Visual Arts and Design Computing. 1 Credit Hour.

ARCH 8852. Special Topics: Visual Arts and Design Computing. 2 Credit Hours.

ARCH 8853. Special Topics: Visual Arts and Design Computing. 3 Credit Hours.

ARCH 8855. Special Topics. 5 Credit Hours.
Special topics in design.

ARCH 8856. Special Topics. 6 Credit Hours.
Special topics in advanced design.

ARCH 8863. Special Topics. 3 Credit Hours.
Topics of current interest in architecture.

ARCH 8866. Special Topics. 6 Credit Hours.
Special topics in Design & Research studio.

ARCH 8873. Special Topics. 3 Credit Hours.

ARCH 8901. Special Problems. 1-21 Credit Hours.

ARCH 8902. Special Problems. 1-21 Credit Hours.

ARCH 8903. Special Problems. 1-21 Credit Hours.

ARCH 8911. Special Problems: Architectural Design. 1-21 Credit Hours.

ARCH 8912. Special Problems: Architectural Design. 1-21 Credit Hours.

ARCH 8913. Special Problems: Architectural Design. 1-21 Credit Hours.

ARCH 8914. Special Problems: Architectural Design. 1-21 Credit Hours.

ARCH 8915. Special Problems: Architectural Design. 1-21 Credit Hours.

ARCH 8921. Special Problems: History, Theory, and Criticism. 1-21 Credit Hours.

ARCH 8922. Special Problems: History, Theory, and Criticism. 1-21 Credit Hours.

ARCH 8923. Special Problems: History, Theory, and Criticism. 1-21 Credit Hours.

ARCH 8924. Special Problems: History, Theory, and Criticism. 1-21 Credit Hours.

ARCH 8925. Special Problems: History, Theory, and Criticism. 1-21 Credit Hours.

ARCH 8931. Special Problems: Architectural Technology. 1-21 Credit Hours.

ARCH 8932. Special Problems: Architectural Technology. 1-21 Credit Hours.

ARCH 8933. Special Problems: Architectural Technology. 1-21 Credit Hours.

ARCH 8941. Special Problems: Professional and Social Practice. 1-21 Credit Hours.

ARCH 8942. Special Problems: Professional and Social Practice. 1-21 Credit Hours.

ARCH 8943. Special Problems: Professional and Social Practice. 1-21 Credit Hours.

ARCH 8951. Special Problems: Visual Arts and Design Computing. 1-21 Credit Hours.

ARCH 8952. Special Problems: Visual Arts and Design Computing. 1-21 Credit Hours.

ARCH 8953. Special Problems: Visual Arts and Design Computing. 1-21 Credit Hours.

ARCH 8996. Prep Doctoral Dissertation. 1-21 Credit Hours.
Preparation for Qualifying Paper in Doctorial Program in Architecture.

ARCH 8997. Teaching Assistantship. 1-9 Credit Hours.
For graduate students holding graduate teaching assistantships.

ARCH 8998. Research Assistantship. 1-9 Credit Hours.
For gratuate students holding graduate research assistantships.

ARCH 8999. Preparation for Doctoral Dissertation. 1-21 Credit Hours.

ARCH 9000. Doctoral Thesis. 1-21 Credit Hours.

Air Force Aerospace Studies (AS)

AS 1000. Air Force Leadership-Lab. 1 Credit Hour.
Air Force customs and courtesies, drill and ceremonies, and introduction to the military environment. Emphasis on developing the leadership and interpersonal skills needed of Air Force officers.

AS 1110. Heritage and Values of the Air Force I. 1 Credit Hour.
A survey course designed to introduce students to the Department of the Air Force (DAF) and provides an overview of the basic characteristics, missions, communications and organization of the Air and Space Forces. Topics include: Formation of the Air Force, Military Customs and Courtesies, and Introduction to Leadership. Leadership Laboratory is mandatory for AFROTC cadets and complements this course.

AS 1120. Heritage and Values of the Air Force II. 1 Credit Hour.
A survey course designed to introduce students to the Department of the Air Force (DAF) and provides an overview of the basic characteristics, missions, communications and organization of the Air and Space Forces. Topics include: What is War?, Principles of War and Tenets of Airpower, and What the Department of the Air Force Brings to the Fight. Leadership Laboratory is mandatory for AFROTC cadets and complements this course.

AS 2210. U.S. Air and Space Power Fundamentals I. 1 Credit Hour.
This course provides a fundamental understanding of both leadership and team building. The lessons and course flow are designed to prepare students for field training and leadership positions in the detachment. Topics include: Listening, Full-Range Leadership, and Standards and Accountability. Leadership Laboratory is mandatory for AFROTC cadets and complements this course.

AS 2220. U.S. Air and Space Power Fundamentals II. 1 Credit Hour.
This course provides a fundamental understanding of both leadership and team building. The lessons and course flow are designed to prepare students for field training and leadership positions in the detachment. Topics include: Human Relations, Conflict Management, and Stress Management and Resiliency. Leadership Laboratory is mandatory for AFROTC cadets and complements this course.

AS 3310. Leading People and Effective Communication I. 3 Credit Hours.
This course utilizes student's field training experience to take a more in-depth look at leadership. Special emphasis is placed on enhancing communication skills, and why that is important as a leader. Students have an opportunity to try out these leadership and management techniques in a supervised environment as juniors and seniors. Topics include: Change Management, Leading Diverse Organizations, and Managing Competing Priorities. Leadership Laboratory is mandatory for AFROTC cadets and complements this course.

AS 3320. Leading People and Effective Communication II. 3 Credit Hours.
This course utilizes student's field training experience to take a more in-depth look at leadership. Special emphasis is placed on enhancing communication skills, and why that is important as a leader. Students have an opportunity to try out these leadership and management techniques in a supervised environment as juniors and seniors. Topics include: Mentoring, Ethical Decision Making, and Establishing Expectations. Leadership Laboratory is mandatory for AFROTC cadets and complements this course.

AS 4410. National Security and Preparation for Active Duty I. 3 Credit Hours.
This course is designed for college seniors and provides them the foundation to understand their role as military officers and how they are directly tied to our National Security Strategy. It is an overview of the complex social and political issues facing the military profession and requires a measure of sophistication commensurate with the senior college level. Topics include: National Security Strategy, The Total Force, and Capabilities and Force Packaging. Leadership Laboratory is mandatory for AFROTC cadets and complements this course.

AS 4420. National Security and Preparation for Active Duty II. 3 Credit Hours.
This course is designed for college seniors and provides them the foundation to understand their role as military officers and how they are directly tied to our National Security Strategy. It is an overview of the complex social and political issues facing the military profession and requires a measure of sophistication commensurate with the senior college level. Topics include: Leadership Authority and Responsibility, Military Justice, and Airmen Comprehensive Assessment. Leadership Laboratory is mandatory for AFROTC cadets and complements this course.

Applied Systems Engineering (ASE)

ASE 6001. Fundamentals of Modern Systems Engineering. 3 Credit Hours.
Explore a wide range of modern systems engineering principles and development methodologies. Address requirements engineering, systems definition, design and analysis, implementation, operation, and technical management.

ASE 6002. Systems Design and Analysis. 3 Credit Hours.
Introduce emerging techniques for systems and systems-of-systems analysis including IPPD, DOE, Taguchi methods, response surface equations, multi-attribute decision making, and concept feasibility assessment.

ASE 6003. Modeling and Simulation for Systems Engineers. 3 Credit Hours.
Introduction to modeling and simulation for systems engineers. Topics include problem formulation, conceptual modeling, simulation methodologies, verification and validation, DOE, simulation execution, and output analysis.

ASE 6004. Leading Systems Engineering Teams. 3 Credit Hours.
Systems engineering processes provide a model for successfully managing complex systems. Learn to apply management and development techniques used for successful commercial and government programs.

ASE 6005. Advanced Topics in Systems Engineering: Systems Modeling with SysML. 3 Credit Hours.
This core elective introduces SymML as a system modeling and design tool, with example applications, guidelines for application, and student projects on implementations in practice.

ASE 6006. Systems Engineering Laboratory. 3 Credit Hours.
Application of working knowledge of systems engineering techniques applied to a "case study" in an applicable domain.

ASE 6101. Vehicle Systems Analysis and Synthesis. 3 Credit Hours.
Vehicle Preliminary Design involves design iteration with disciplinary physics-based methods and tools. Includes geometry and databases from conceptual design, six DOF modeling, analysis, and synthesized baseline.

ASE 6102. System of Systems and Architecture. 3 Credit Hours.
Develop a broader understanding of the interdependencies and interoperability issues, interfaces, and processes for creating and defining Systems Architecture for complex systems.

ASE 6103. Complex System Lifecycle and Integration. 3 Credit Hours.
System preliminary design must address product and process design throughout system lifecycle from integration through manufacturing to phase-out along with interfaces to other emerging systems.

ASE 6104. Complex System Design and Integration (Capstone). 3 Credit Hours.
Student teams apply methods and techniques taught throughout the program to conduct complex system Conceptual Design based on requirements provided in a Request for Proposal.

ASE 6111. Sensor Systems Analysis and Synthesis. 3 Credit Hours.
Defines, classifies, and examines technology used in stand-alone sensor systems. Centers on system-engineering trades useful in designing systems of sensors and systems of systems.

ASE 6121. Information Systems Analysis and Synthesis. 3 Credit Hours.
Tools and approaches for analysis and synthesis of enterprise information systems. Topics include user-centered requirement, scenario-based design, UML, network/communications, iterative prototyping, and enterprise support.

ASE 6131. Analysis and Synthesis: Human Systems Integration. 3 Credit Hours.
Human Systems Integration Analysis and Synthesis, a PMASE complex systems elective, ensures human-related technical issues are properly addressed during system definition, design, development, and implementation.

ASE 8801. Special Topics. 1 Credit Hour.
Topics of current interest in Applied Systems Engineering.

ASE 8803. Special Topics. 3 Credit Hours.
Topics of current interest in Applied Systems Engineering.

ASE 8901. Special Problems. 1-21 Credit Hours.

Building Construction (BC)

BC 1XXX. Building Construction Elective. 1-21 Credit Hours.

BC 2610. Construction Technology I. 3 Credit Hours.
An introduction to the planning and physical development process for the construction of projects of residential and light construction scale.

BC 2620. Construction Technology II. 3 Credit Hours.
A continuation of Construction Technology I with an emphasis on large-scale and high-rise building, i.e., commercial building construction.

BC 2631. Introduction to Construction Management. 2 Credit Hours.
Provides an introduction to the construction industry with emphasis on exploring career opportunities in construction.

BC 2632. Construction Materials and Methods. 3 Credit Hours.
The course will cover the planning and physical development process for the construction of residential, commercial and heavy/industrial projects.

BC 2634. Construction Plans and Estimates. 3 Credit Hours.
Course focuses on reading and accessing project drawing information, and estimating quantities for pricing of materials, labor, subcontracts and equipment.

BC 2636. Construction Safety. 3 Credit Hours.
This course introduces the core elements of an effective safety and health management system in a construction project, and describes the application of OSHA standards.

BC 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

BC 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

BC 2XXX. Building Construction Elective. 1-21 Credit Hours.

BC 3600. Construction Cost Management. 3 Credit Hours.
Introduction to cost principles and cost analysis of construction projects, including classification of work, quantity survey techniques, construction operation costs, and bid proposals.

BC 3610. Construction Law. 3 Credit Hours.
Legal aspects of construction contracts, bonds, insurance, and bidding. Owner, architect, contractor, and subcontractor relationships.

BC 3620. Real Estate and Construction Finance and Accounting. 3 Credit Hours.
General introduction to the financing of construction and real estate development projects. Emphasis on financing requirements, activities, sources, and uses.

BC 3630. Project Management I. 3 Credit Hours.
This course will offer construction planning and management techniques for project design and construction with a focus on different scheduling methods and their use.

BC 3640. Construction Mechanics. 3 Credit Hours.
An introductory course to the evaluation of behavior of buildings, the properties of structural materials, and the behavior of load-resisting members.

BC 3XXX. Building Construction Elective. 1-21 Credit Hours.

BC 4010. History of Construction Industry. 3 Credit Hours.
Addresses how today's construction industry is organized and its particular characteristics, how it evolved from early times and where it may be heading in the future.

BC 4050. Building Information Modeling for Multi-disciplinary Integration. 3 Credit Hours.
This course introduces students to BIM and the changes it has been causing to the traditional design, planning, management, construction, facility management, and contracting practices.

BC 4110. Trends & Pol For Res Dev. 3 Credit Hours.
An overview of development in the United States, current trends in residential development, and the impact of external factors on residential development. This course is designed to help Building Construction students understand how their development impacts the social environment and quality of life of the community.

BC 4120. Community Dsgn & Constr. 3 Credit Hours.
An overview of the principles of smart growth, livable communities and new urbanism and how these principles are implemented in the process from design to construction and marketing.

BC 4130. Intg Design Constr & Dev. 3 Credit Hours.
A study of contemporary examples of an integrated approach to design, construction and development. Course involves real-world project analysis from multiple points of view.

BC 4140. Construction Management Project. 3 Credit Hours.
This class is the application of course materials covered throughout the Certificate in Construction Management to an actual construction project with a simulated business construct.

BC 4270. Sustainable Community Design and Construction. 3 Credit Hours.
An overview of the principles of smart growth, livable communities, and new urbanism and how these principles are implemented in the process from design to construction and marketing.

BC 4600. Project Management II. 3 Credit Hours.
This course covers practical project management, technology, and tools for this approach and the required management skills for successful execution of projects.

BC 4610. Value Engineering and Building Economics. 3 Credit Hours.
First part is an introduction to principles and methodology. Second part is an introduction to economic principles and theories and how to apply the concepts and methods of building economics.

BC 4620. Building Structural Analysis. 3 Credit Hours.
Emphasis being placed on the practical design and construction of structural elements. The course includes basic design principles with a heavy emphasis on constructability and buildability.

BC 4630. Senior Capstone Project. 3 Credit Hours.
A senior construction project that includes redevelopment analysis and feasibility study, project development, and construction.

BC 4640. Construction Marketing. 3 Credit Hours.
Methods of construction marketing and business development. Innovative computer applications, verbal skills development, professional strategies, market segmentation, and buyer behavior.

BC 4650. Laboratory for Sustainable Design and Construction. 3 Credit Hours.
The goal of the laboratory is to teach students a comprehensive sustainable design and construction information system and a program of real-world, hands-on projects.

BC 4660. Entrepreneurship in Construction. 3 Credit Hours.
Basics of construction business risk assessment, looking for construction opportunities, capital investment, computerized construction business, and business failures.

BC 4672. Mechanical, Electrical and Plumbing Systems for Construction Managers. 3 Credit Hours.
The course will cover the fundamentals of design, selection, installation, commissioning, and maintenance of mechanical, electrical and plumbing systems. Credit not allowed for both BC 4672 and BC4670.

BC 4680. Professional Internship. 3 Credit Hours.
Students work for a professional architecture/engineering/ construction company in which they learn, first-hand, about the construction industry.

BC 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

BC 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

BC 4700. Construction Management. 3 Credit Hours.
An accelerated-pace course designed to provide a basic understanding of fundamental topics including planning, budgeting, estimation, scheduling, and project close out.

BC 4710. Green Construction. 3 Credit Hours.
This course focuses on the means, methods, strategies, and technologies to improve the energy efficiency and performance of buildings, and to reduce the environmental impact of buildings.

BC 4720. Residential Construction and Property Management. 3 Credit Hours.
A course designed to orient students to the basics of apartment management and includes the business functions of marketing, leasing, and financing.

BC 4730. Best Practices in Multi-Family Property. 3 Credit Hours.
A course designed to provide students with a broad range of the best practices related to the management of all types of multi-family residential property.

BC 4735. Real Estate Development and Construction. 3 Credit Hours.
Provides an overview of the real estate development process as it pertains to construction development including trends and current issues.

BC 4801. Special Topics. 1 Credit Hour.

BC 4802. Special Topics. 2 Credit Hours.

BC 4803. Special Topics. 3 Credit Hours.

BC 4823. Special Topics. 3 Credit Hours.

BC 4833. Special Topics. 3 Credit Hours.

BC 4843. Special Topics. 3 Credit Hours.
Topics of current interest in building construction.

BC 4900. Special Problems. 1-21 Credit Hours.

BC 4XXX. Building Construction Elective. 1-21 Credit Hours.

BC 6002. Issues in Sustainable Construction Technology. 3 Credit Hours.
Course designed to help students achieve a basic understanding of the materials used in the commercial segments in the construction industry and how these relate to sustainable construction.

BC 6004. Sustainable Energy in Architecture, Engineering and Construction. 3 Credit Hours.
An introductory course on sustainale energy in architecture, engineering and construction. The goal of the course is to introduce students to fundamental concepts of sustainable sources of energy to power buildings and address the impact of these sources to applicable green building rating systems.

BC 6005. Technology Applications in the Construction Industry. 3 Credit Hours.
Hands-on exploration of various present and Future technologies that can be applied in all stages of a facilities' lifecycle.

BC 6006. Advanced Cost Management. 3 Credit Hours.
Cost management and control from early project inception to completion and applications throughout the life of a facility.

BC 6010. History of Construction Industry. 3 Credit Hours.
Addresses how today's construction industry is organized and its particular characteristics, how it evolved from early times and where it may be heading in the future.

BC 6025. Construction Management. 3 Credit Hours.
An accelerated paced course providing graduate students a basic understanding of fundamental topics including planning, budgeting, estimating, scheduling and project closeout.

BC 6050. Building Information Modeling for Multi-disciplinary Integration. 3 Credit Hours.
This course introduces students to BIM and the changes it has been causing to the traditional design, planning, management, construction, facility management, and contracting practices. Credit will not be awarded for both BC 4050 and BC 6050.

BC 6100. Professional Trends in Facility Management. 3 Credit Hours.
An introductory course covering the organizational, managerial, ethical, and legal principles for the delivery of facility management services. Includes contracts and risk management.

BC 6125. Professional Internship. 3 Credit Hours.
A course in which students work for a professional architecture/engineering/construction company in which they learn, first-hand, about the construction industry.

BC 6150. Design-Build Organization and Management. 3 Credit Hours.
Introduction to Design-Build (DB) as a project delivery system. Provides information about the organization, the process, and the effects of DB on the industry.

BC 6175. Real Estate Development and Construction. 3 Credit Hours.
Provides an overview of the real estate development process as it pertains to construction development including trends and current issues.

BC 6185. Introduction to Construction Program Management. 3 Credit Hours.
Survey of the construction program management profession, focusing on the comprehensive management of single and multiple building programs including pre-design, design, construction and post-construction activities.

BC 6200. Maintenance Management of Built Assets. 3 Credit Hours.
This course covers the processes by which a facility and its systems are serviced and maintained during the facility's life cycle. Includes acquisition, installation, operation, maintenance, and disposal of built assets.

BC 6250. Value Management for Integrated Facility Design and Construction. 3 Credit Hours.
Principles and methodology of value management analysis concepts and an examination of future values and worth criteria affecting building design, construction, furnishings, and operations performance.

BC 6270. Community Design and Development. 3 Credit Hours.
An overview of the principles of smart growth, livable communities and new urbanism and how these principles are implemented in the process from design to construction and marketing.

BC 6275. Community Dsgn & Constr. 3 Credit Hours.
An overview of the principles of smart growth, livable communities and new urbanism and how these principles are implemented in the process from design to construction and marketing.

BC 6285. Management of Pre-design Phase as Owner. 3 Credit Hours.
Examination of the Program Manager's role and responsibilities as owner during the pre-design phase including feasibility, organization, financing, legal, entitlement, planning, budgeting, scheduling, and team selection.

BC 6300. Safety and Environmental Issues. 3 Credit Hours.
This course covers the environmental issues related to the performance of buildings and the health and risk factors for new and existing buildings.

BC 6350. Design and Construction Law. 3 Credit Hours.
Overview of construction law and legal issues encountered by the construction manager including U.S. laws, general concepts and definitions, contractor relationships, and relevant case studies.

BC 6370. Real Estate Policy, Trends, Ethics. 3 Credit Hours.
The application of market, community, and policy factors to create new development while professionally managing potential conflicts between these factors.

BC 6375. Trends & Pol For Res Dev. 3 Credit Hours.
An overview of development in the United States, current trends in residential development, and the impact of governmental regulations on residential development. This course is designed to help Building Construction students understand how their development impacts the social environment and quality of life of the community.

BC 6385. Management of Design Phase as Owner. 3 Credit Hours.
Examination of the Program Manager's role and responsibilities as Owner during the design phase.

BC 6400. Facility Planning, Project Management, and Benchmarking. 3 Credit Hours.
This course introduces the techniques of planning project management, benchmarking, and their applications to facility management. Includes space forecasting, scheduling and control of projects, and benchmarking studies.

BC 6475. Real Estate Development Law. 3 Credit Hours.
Comprehensive overview of legal, property, and entitlement issues associated with the real estate development process.

BC 6485. Management of Preconstruction Phase as Owner. 3 Credit Hours.
This course covers the management and oversight activities of the owner and program manager conducted during the pre-design and design phases of a construction project.

BC 6500. Real Estate Asset and Income Property Management. 3 Credit Hours.
This course covers real estate financial management and performance topics from a decision making and strategic planning orientation for facilities management professionals.

BC 6550. Design and Construction Processes for Integrated Services. 3 Credit Hours.
Offers a framework for use and application of design, contract, and performance documents for successful execution of various forms of integrated project delivery systems.

BC 6570. Real Estate Development Basic Finance. 3 Credit Hours.
Comprehensive overview of the business model and financing methodology to analyze and produce new real estate development.

BC 6575. Real Estate Production Finance. 3 Credit Hours.
Business model and financing process required to produce new real estate developments through an investigation of land acquisition, development and construction financial management.

BC 6585. Management of Construction as Owner. 3 Credit Hours.
Survey of construction management from the owner's perspective.

BC 6600. Facilities Management Financial Analysis. 3 Credit Hours.
This course covers real property concepts, issues, and topics pertinent to the facility management professional. The topics include site selection, property market analysis, legal documents, and land use control.

BC 6650. Advanced Project Management. 3 Credit Hours.
A four-phased coverage of project management including organization, planning and scheduling, control, budgeting, and ending with project testing, evaluation, and termination.

BC 6675. Residential Design and Construction. 3 Credit Hours.
Course will examine the application of market, community, and regulatory factors to single family housing design and construction; construction management process required for efficient delivery.

BC 6685. Leadership and Communications in Design and Construction. 3 Credit Hours.
Framework and guidelines for effective leadership and communications during design and construction.

BC 6700. Advanced Facility Management Practices. 3 Credit Hours.
Students apply specific methods and procedures from core courses to actual business situations in the facility and property management industry.

BC 6731. Zero Energy Housing. 3 Credit Hours.
Design, analysis, operation, construction, and cost feasibility of so-called "zero energy" houses. Credit not allowed for both BC 6731 and ARCH 6731.

BC 6800. Facility and Property Management Capstone. 3 Credit Hours.
Designed to integrate the learning from basic topics through the use of actual case studies and situations found within the facility and property management industry.

BC 6850. Building Construction and Facility Management Capstone. 3 Credit Hours.
Application of coursework covered in the Master of Science in Building Construction and Facility Management curriculum with a stimulated business construct from different perspectives: construction manager, program manager, or facility manager.

BC 6875. Real Estate Development Capstone Project. 3 Credit Hours.
Formulation and exploration of a real estate development project. Topics include business plan, market analysis, site selection, regulations, finance, project delivery, design and engineering.

BC 6910. Best Practices in Multi-Family Property. 3 Credit Hours.
A course designed to provide students with a broad range of the best practices related to the management of all types of multi-family residential property.

BC 6920. Introduction to Residential Property Management. 3 Credit Hours.
A course designed to orient students to the basics of apartment management and includes the business functions of marketing, leasing, and financing.

BC 6930. Intg Design Constr & Dev. 3 Credit Hours.
This course will focus on contemporary integrated approach to design, construction and development. Course involves real-world project analysis from multiple points aof view. Examples to be selected from the Atlanta region.

BC 6975. The Evolution of a Deal. 3 Credit Hours.
Presentations and site visits conducted by developers to expose students to design program implementation, financial structure, and project management.

BC 6XXX. Building Construction Elective. 1-21 Credit Hours.

BC 7000. Master's Thesis. 1-21 Credit Hours.

BC 7100. Quantitative Methods for Construction Research. 3 Credit Hours.
Introductory course in graduate research in the building construction industry. Covers types of research, sampling methods, and basic analysis and evaluation techniques.

BC 7200. Advanced Readings in BC in Preparation for the PhD Comprehensive Examination. 1-12 Credit Hours.
This course is designed around advanced readings in research and practice for PhD students working in the building construction area.

BC 8000. PhD Seminar for Students with Building Construction Emphasis. 1 Credit Hour.
This is an introduction to PhD-level research in Building Construction.

BC 8100. Research Methodology. 3 Credit Hours.
Research design course that teaches the basics of creating credible scientific research plans with examples from construction related research.

BC 8803. Special Topics. 3 Credit Hours.

BC 8811. Special Topics. 1 Credit Hour.
Topics of current interest in building construction.

BC 8812. Special Topics. 2 Credit Hours.
Topics of current interest in building construction.

BC 8813. Special Topics. 3 Credit Hours.
Topics of current interest in building construction.

BC 8814. Special Topics. 4 Credit Hours.
Topics of current interest in building construction.

BC 8815. Special Topics. 5 Credit Hours.
Topics of current interest in building construction.

BC 8823. Special Topics. 3 Credit Hours.
Topics of current interest in building construction.

BC 8833. Special Topics. 3 Credit Hours.
Topics of current interest in building construction.

BC 8843. Special Topics. 3 Credit Hours.
Topics of current interest in building construction.

BC 8901. Special Problems. 1-21 Credit Hours.

BC 8902. Special Problems. 1-21 Credit Hours.

BC 8903. Special Problems. 1-21 Credit Hours.

BC 8997. Teaching Assistantship. 1-9 Credit Hours.
For graduate students holding graduate teaching assistantship.

BC 8998. Research Assistantship. 1-9 Credit Hours.
For graduate students holding graduate research assistantship.

BC 8999. Doctoral Thesis Preparation. 1-21 Credit Hours.
This course is designed to synthesize the knowledge and skills developed in previous research courses and apply them to the doctoral dissertation process for students in Building Construction.

BC 9000. Doctoral Thesis. 1-12 Credit Hours.
Preparation of doctoral thesis for Ph.D. in Building Construction.

Building Construction - Professional (BCP)

Biology (BIOL)

BIOL 6150. Genomics and Applied Bioinformatics. 3 Credit Hours.
Retrieval and analysis of biological sequence, gene expression, and proteomics data from public databases and other sources; applying standard bioinformatics tools to investigate biological questions. Credit not allowed for both BIOL 6150 and BIOL 4150.

BIOL 6221. Biological Oceanography. 3 Credit Hours.
An introduction to the major biological processes in the ocean, including primary production, elemental cycling, food webs, and fisheries.

BIOL 6410. Microbial Ecology. 3 Credit Hours.
Advanced studies of microbial ecosystems, the specific roles of bacteria in maintaining ecological balance, and the evolution of the ecosystem in response to changing environments.

BIOL 6417. Marine Ecology. 3 Credit Hours.
An overview of the ecological and evolutionary patterns, processes, and mechanisms affecting the organization, structure, and function of a broad variety of marine communities. Credit not allowed for both BIOL 6417 and BIOL 4417.

BIOL 6418. Microbial Physiology. 3 Credit Hours.
Study of the physiology of growth and metabolic activities of microorganisms.

BIOL 6428. Population Dynamics. 3 Credit Hours.
Students will examine the ecological factors that affect dynamics, regulation, and evolution of natural populations, emphasizing the connections with mathematical models, genetics, and ecology. Credit will not be awarded for both BIOL 6428 and BIOL 4428.

BIOL 6478. Methods in Molecular Biophysics. 3 Credit Hours.
An introduction to biophysical methods that are employed to study biological macromolecules and their interaction to gain understanding of how they function. Credit not allowed for both BIOL 6478 and BIOL 4478.

BIOL 6505. Programming in Biological and Health Sciences. 3 Credit Hours.
This course introduces students to the basics of coding, applied to fundamental biological and medical questions.

BIOL 6570. Immunology. 4 Credit Hours.
A survey of modern immunology and its applications, with emphasis on immunological methods used in molecular and cell biological research.

BIOL 6600. Evolution. 3 Credit Hours.
An introduction to evolutionary patterns and processes, including the history of life, phylogenetics, population genetics, quantitative genetics, molecular evolution, and other important topics in evolutionary biology.

BIOL 6607. Molecular Biology of Microbes: Disease, Nature, and Biotechnology. 3 Credit Hours.
Molecular genetics of bacteria with an emphasis on experimental approaches, regulatory mechanisms in disease-causing and environmental bacteria, and biotechnology applications derived from microbes. Credit will not be awarded for both BIOL 6607 and BIOL 4607, BIOL 4608, or BIOL 6608.

BIOL 6611. Advanced Microbial Physiology. 3 Credit Hours.
Advanced studies of selected aspects of the physiololgy of prokaryotic and eukaryotic microorganisms.

BIOL 6620. Aquatic Chemical Ecology. 3 Credit Hours.
The course focuses on understanding the chemical mechanisms of aquatic signaling and the cascading effects on population regulation, community organization, and ecosystem function. Credit not allowed for both BIOL 6620 and BIOL 4620.

BIOL 6720. Environmental Microbial Genomics. 3 Credit Hours.
To introduce advanced concepts and principles of contemporary environmental microbiological research and assosciated bioinformatics techniques through representative examples from recent literature.

BIOL 6750. Foundations of Quantitative Biosciences. 4 Credit Hours.
Introduction to quantitative methods and logic that enable key advances in understanding living systems, spanning molecules, cells, organisms, and biomes.

BIOL 6756. Discovery of Signaling Molecules. 3 Credit Hours.
The diversity of chemical signals between organisms and their structural specificities will be presented along with chemical and biological methods for isolating signaling molecules. Crosslisted with CEE 6756 and CHEM 6756.

BIOL 6765. Geomicrobiology. 3 Credit Hours.
Interactions between microorganisms and the geosphere, microbial energetics and genetics; geochemical controls on microbial diversity and activity. Crosslisted with EAS 6765.

BIOL 6XXX. Biology Elective. 1-21 Credit Hours.

BIOL 7000. Master's Thesis. 1-21 Credit Hours.

BIOL 7001. Foundations in Molecular and Cell Biology. 4 Credit Hours.
The goal of this course is to provide new students with fundamental knowledge in the general areas of prokaryotic and eukaryotic molecular biology, biochemistry, structural biology, and bioinformatics.

BIOL 7010. Advanced Cell Biology. 3 Credit Hours.
Current topics in eukarytotic cell biology including membrane functions, intracellular sorting and compartmentalization, cell signaling, cell cycle, cytoskeleton, cell adhesion, motility, and current experimental approaches.

BIOL 7015. Cancer Biology and Technology. 3 Credit Hours.
This course covers the major concepts of cancer biology as well as to state-of-the-art technologies that are being applied to cancer research, detection and treatment. Credit not allowed for both BIOL 7015 and BIOL 4015.

BIOL 7111. Molecular Evolution. 3 Credit Hours.
Evolutionary processes at the molecular level, organizations of genomes and genetic systems. Students will read and present up-to-date research articles in various topics in molecular evolution.

BIOL 7200. Programming for Bioinformatics. 3 Credit Hours.
This active-learning, project-based course provides a rigorous introduction to scientific computing for bioinformatics, including Linux utilities, shell scripting and bioinformatics programming.

BIOL 7210. Computational Genomics. 3 Credit Hours.
In this active learning class, students will learn to convert sequence information into knowledge through the use of computational genomics tools, applications and databases.

BIOL 7914. Advances in Bacteriology. 2 Credit Hours.
Topics of current interest in the physiology and ecology of bacteria and applications to practical problems.

BIOL 7923. Advances in Ecology. 2 Credit Hours.
Topics of current interest in the general areas of population growth and limitation, and the structure and stability of ecosystems.

BIOL 7924. Advances in Environmental Biology. 2 Credit Hours.
Topics of current interest in environmental biology.

BIOL 7963. Advances in Molecular Biology. 2 Credit Hours.
Topics of current interest in molecular biology.

BIOL 7964. Advances in Genetics. 2 Credit Hours.
Topics of current interest in genetics.

BIOL 8002. Seminar. 1 Credit Hour.
Weekly seminars on current research presented by various scientists in the field of biology.

BIOL 8003. Seminar. 1 Credit Hour.
Weekly seminars on current research presented by various scientists in the field of biology.

BIOL 8050. Professional development in quantitative biosciences. 1 Credit Hour.
Enhance the professional development of Quantitative Biosciences PhD students in preparing and submitting fellowships and in organizing scientific workshops and events.

BIOL 8060. Seminar in Quantitative Biosciences. 1 Credit Hour.
This course will introduce QBioS to QBioS Program Faculty, allowing them to learn about QBioS faculty members' research and academic history.

BIOL 8061. Current Research in the Quantitative Biosciences. 1 Credit Hour.
The overall objective of the course is to enable QBioS PhD students to attend seminars on advances across all areas of the life sciences, including those by 4th year QBioS students.

BIOL 8106. Tools of Science Seminar. 2 Credit Hours.
This course addresses issues important to all successful scientists and engineers such as: research ethics; collaborations between industry, academics, and government; women and minorities in science; balancing research, teaching and service; writing, editing, and reviewing, presentations; job interviews; time management; speaking to the public and media; and scientific and university politics.

BIOL 8510. Epigenetics, Stem Cells, and Development. 3 Credit Hours.
This course will introduce the basic concepts and mechanisms in epigenetics, covering topics ranging from stem cell reprogramming, organismal development, social behaviors, to human diseases.

BIOL 8515. Community Ecology. 3 Credit Hours.
An advanced ecology course that covers classic and contemporary concepts, patterns, and processes in the field of community ecology.

BIOL 8530. Human Evolutionary Genomics. 3 Credit Hours.
An advanced course where students will discuss primary literature and use computational tools to investigate how evolution has shaped global patterns of human genetic variation.

BIOL 8550. Origin of complex life: from cells to societies. 3 Credit Hours.
This course examines the evolutionary origins of complex life. We will examine the history of life on Earth and evolutionary process through which complexity arises.

BIOL 8560. RNA Biology and Bitechnology. 3 Credit Hours.
The purpose of this course is to introduce students (graduate and upper level undergraduate) to the fundamental concepts of RNA biology and to state-of-the-art biotechnologies that use RNA for medical and industrial applications.

BIOL 8744. Microbial Symbiosis & Microbiomes. 3 Credit Hours.
This course explores how symbiotic interactions with microbes affect the biology of other organisms, focusing extensively on the beneficial microbes native to the human body.

BIOL 8801. Special Topics. 1 Credit Hour.
New graduate lecture courses in areas of current interest.

BIOL 8802. Special Topics. 2 Credit Hours.
New graduate lecture courses in areas of current interest.

BIOL 8803. Special Topics. 3 Credit Hours.
New graduate lecture courses in areas of current interest.

BIOL 8804. Special Topics. 4 Credit Hours.
New graduate lecture courses in areas of current interest.

BIOL 8805. Special Topics. 5 Credit Hours.
New graduate lecture courses in areas of current interest.

BIOL 8813. Special Topics. 3 Credit Hours.
Special Topics in Biology.

BIOL 8814. Special Topics. 4 Credit Hours.
Special Topics in Biology (lecture + supervised lab).

BIOL 8823. Special Topics. 3 Credit Hours.

BIOL 8833. Special Topics. 3 Credit Hours.
Special Topics in Biological Sciences.

BIOL 8901. Special Problems. 1-21 Credit Hours.
Research problems in biology under the supervision of a faculty member.

BIOL 8902. Special Problems. 1-21 Credit Hours.
Research problems in biology under the supervision of a faculty member.

BIOL 8997. Teaching Assistantship. 1-9 Credit Hours.
For graduate students holding a teaching assistantship.

BIOL 8998. Research Assistantship. 1-9 Credit Hours.
For graduate students holding research assistantships.

BIOL 9000. Doctoral Thesis. 1-21 Credit Hours.

Biological Sciences (BIOS)

BIOS 1107. Biological Principles. 3 Credit Hours.
An introduction to biological principles, including biomacromolecules, bioenergetics, cell structure, genetics, evolution, and ecological relationships for STEM majors and prehealth students.

BIOS 1107L. Biological Principles Laboratory. 1 Credit Hour.
A laboratory-based introduction to biological principles, including biomacromolecules, bioenergetics, cell structure, genetics, evolution, and ecological relationships for STEM majors and prehealth students.

BIOS 1107R. BIOS 1107 Recitation. 0 Credit Hours.
Recitation for BIOS 1107.

BIOS 1108. Organismal Biology. 3 Credit Hours.
An introduction to organ and organismal biology, emphasizing physiological processes, growth/development, and biodiversity from an evolutionary perspective for STEM majors and prehealth students.

BIOS 1108L. Organismal Biology Laboratory. 1 Credit Hour.
A laboratory-based introduction to organ and organismal biology, emphasizing physiological processes, growth/development, and biodiversity from an evolutionary perspective for STEM majors and prehealth students.

BIOS 1108R. BIOS 1108 Recitation. 0 Credit Hours.
Recitation for BIOS 1108.

BIOS 1207. Biological Principles for Majors. 3 Credit Hours.
An introduction to the basic principles of modern biology, including biomacromolecules, bioenergetics, cell structure, genetics, evolution, and ecological relationships.

BIOS 1207L. Biological Principles Project Laboratory. 1 Credit Hour.
A project-based laboratory introduction to the basic principles of modern biology, including biomacromolecules, bioenergetics, cell structure, genetics, evolution, and ecological relationships,

BIOS 1207R. BIOS 1207 Recitation. 0 Credit Hours.
Recitation for BIOS 1207.

BIOS 1208. Organismal Biology for Majors. 3 Credit Hours.
An introduction to biology at the organ and organismal level, with emphasis on physiological processes, integration of growth and development, and biodiversity from an evolutionary perspective.

BIOS 1208L. Organismal Biology Project Laboratory. 1 Credit Hour.
A project-based laboratory introduction to biology at the organ and organismal level, with emphasis on physiological processes, integration of growth and development, and biodiversity from an evolutionary perspective.

BIOS 1208R. BIOS 1208 Recitation. 0 Credit Hours.
Recitation for BIOS 1208.

BIOS 1220. Biology of Sex & Death. 4 Credit Hours.
Students learn biology through the lens of the formation and collapse of biological systems, organized around questions pertaining to life, sex, and death.

BIOS 1220R. Biology of Sex and Death Recitation. 0 Credit Hours.
A recitation period for BIOS 1220, an introduction to biology and scientific methodology organized around questions pertaining to life, sex, and death.

BIOS 1XXX. Biological Sciences Elective. 1-21 Credit Hours.

BIOS 2100. Island Biogeography of New Zealand. 3 Credit Hours.
Introduction to theory of island biogeography focused on New Zealand's geological history and unique biota.

BIOS 2300. Ecology. 3 Credit Hours.
Introduction to ecological processes at individual, population, and community levels that occur in plant, animal, and microbial taxa, and their relevance to current environmental problems.

BIOS 2301. Ecology Laboratory. 1 Credit Hour.
The companion laboratory for BIOS 2300 (Ecology). This course stresses understanding ecological concepts through a combination of lab and field experiments, and computer simulations.

BIOS 2310. Problems in Ecology. 3 Credit Hours.
Problem-based learning approach to modern ecology from populations to communities, stressing independent analysis, scientific thinking, communication and projects in local communities.

BIOS 2311. Problems in Ecology Laboratory. 1 Credit Hour.
Companion lab to Problems in Ecology. Problem-based learning approach to modern ecology, stressing independent analysis, scientific thinking, communication and projects in local communities.

BIOS 2400. Math Models in Biology. 3 Credit Hours.
Introductory probability and deterministic models in biology, including discrete and continuous probability distributions and dynamic models from molecular and cellular biology to ecology and epidemiology.

BIOS 2500. Introduction to Sport Science. 3 Credit Hours.
Students will apply scientific principles to human performance related to sport and movement across an array of topics (e.g., rehabilitation, exercise physiology, locomotion biomechanics, prosthetics).

BIOS 2600. Genetics. 3 Credit Hours.
Mendelian and molecular genetics: principles of inheritance, gene structure and function, foundations of recombinant DNA technology, genetic basis of variation and evolution.

BIOS 2601. Genetics Laboratory. 1 Credit Hour.
A laboratory course in fundamental techniques of genetic analysis.

BIOS 2610. Integrative Genetics. 3 Credit Hours.
Rigorous in-depth integrated coverage of rules and molecular basis of inheritance, incorporating primary literature and capitalizing on excellent prior knowledge of fundamentals of biology.

BIOS 2611. Integrative Genetics Lab. 1 Credit Hour.
Hands-on introduction to practical techniques, critical thinking, and important concepts in genetics. Students carry out laboratory experiments that explore transmission, population, and molecular genetics.

BIOS 2694. Biology Intern Assistantship. 1-21 Credit Hours.
Biology Undergraduate Internship for pay for freshmen and sophomores, by permit only. The internship experience must be at a unit or agency approved by the School of Biological Sciences.

BIOS 2695. Biology Internship. 1-21 Credit Hours.
Biology Undergraduate Internship for credit for freshmen and sophomores, by permit only. The internship experience must be at a unit or agency approved by the School of Biological Sciences.

BIOS 2698. Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member. Undergraduate research under the guidance of a faculty member for first years and sophomores, or for students with no previous undergraduate-level research experience.

BIOS 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member. Undergraduate research under the guidance of a faculty member for first years and sophomores, or for students with no previous undergraduate-level research experience.

BIOS 2801. Special Topics. 1 Credit Hour.
Lecture course in current special topics in biological sciences. Topics will vary from year to year.

BIOS 2XXX. Biological Sciences Elective. 1-21 Credit Hours.

BIOS 3000. Survey of Medicine. 3 Credit Hours.
Content focuses on scientific, social, and cultural aspects of illness, how perceptions and behavior influence disease concept and fundamental aspects of medical diagnosis and treatment.

BIOS 3100. Ecology & Evolution: An Australian Perspective. 3 Credit Hours.
Evolution and ecology of Australian ecosystems, including rainforests, open woodlands, coastal habitats; conservation of endangered ecosystems. Earns Biology technical credit. Research project required.

BIOS 3380. Microbiology. 3 Credit Hours.
Basic biology of bacteria, fungi, algae, and viruses, with emphasis on bacteriology.

BIOS 3381. Microbiology Lab. 1 Credit Hour.
Fundamental laboratory techniques in microbiology.

BIOS 3400. Mathematical Models in Biology. 3 Credit Hours.
Probability and deterministic models in biology, including discrete and continuous probability distributions and dynamic models from molecular and cellular biology to ecology and epidemiology.

BIOS 3450. Cell and Molecular Biology. 3 Credit Hours.
An introduction to the structure and function of cells and their organelles with emphasis on eucaryotic cellular and molecular processes.

BIOS 3451. Cell and Molecular Biology Lab. 1 Credit Hour.
An introduction to experimental methods of cell and molecular biology research that will cover some fundamental topics of cell biology.

BIOS 3600. Evolutionary Biology. 3 Credit Hours.
A comprehensive overview of evolutionary biology, including processes (e.g., natural selection, genetic drift) and resulting patterns (e.g., genome organization, phylogeny, and the fossil record).

BIOS 3753. Human Anatomy. 3 Credit Hours.
Detailed study of human body structures using a regional and systems approach. Emphasis is placed on structural relationships and the integration of body systems.

BIOS 3754. Laboratory in Human Anatomy. 1 Credit Hour.
A detailed hands-on study of human structure using high resolution models, specialized specimens and dissection of selected mammalian organs and tissues.

BIOS 3755. Human Physiology. 3 Credit Hours.
Students will explore the function and adaptation of the human body emphasizing neuromuscular, cardio-respiratory, gastrointestinal, endocrine, and urinary systems to maintain homeostasis and human health.

BIOS 3756. Physiology Laboratory. 1 Credit Hour.
Course focuses on non-invasive human experiments supplemented with in vitro tissues experiments to explore fundamental physiological concepts and learn basic methods of physiological measurements.

BIOS 3801. Special Topics. 1 Credit Hour.
Lecture course in current special topics in biological sciences. Topics will vary from year to year.

BIOS 3835. Special Topics. 3 Credit Hours.
Special Topics course in the School of Biological Sciences.

BIOS 3XXX. Biological Sciences Elective. 1-21 Credit Hours.

BIOS 4012. Protein Biology. 3 Credit Hours.
Biological view of proteins, including protein biosynthesis, processing, modification, folding, trafficking, interactions, degradation, natural and directed evolution, assembly diseases, amyloids, prions and protein-based inheritance.

BIOS 4015. Cancer Biology and Biotechnology. 3 Credit Hours.
This course covers basic concepts of cancer biology and new technologies that are being developed to understand, detect, treat and prevent cancer.

BIOS 4100. Exercise Physiology. 3 Credit Hours.
Physiology of human movement with emphasis on metabolic, cardiorespiratory, and musculoskeletal aspects; associated topics include body composition, thermoregulation, and ergogenic aids.

BIOS 4150. Genomics and Applied Bioinformatics. 3 Credit Hours.
Retrieval and analysis of biological sequence, gene expression, and proteomics data from public databases and other sources; applying standard bioinformatics tools to investigate biological questions.

BIOS 4200. Kinesiological Basis of Human Movement. 3 Credit Hours.
This course teaches principles related to the biomechanics, energetics and motor control of movement as it applies to human and animal movement, rehabilitation, and sports performance.

BIOS 4221. Biological Oceanography. 3 Credit Hours.
An introduction to the major biological processes in the ocean including primary production, elemental cycling, food webs, and fisheries.

BIOS 4225. Molecular Evolution. 3 Credit Hours.
Evolutionary processes at molecular level, organization of genomes and genetic systems. Students will read and present up-to-date research articles in various topics in molecular evolution.

BIOS 4238. Ion Channels in Health and Disease. 3 Credit Hours.
We will examine the basic biophysical properties, structure-function relationships, physiological regulation, pathology and pharmacological manipulation of ion channels with heavy reliance on recent literature.

BIOS 4340. Medical Microbiology. 3 Credit Hours.
Advanced study of bacteria, protozoa, fungi, and viruses that cause human diseases; emphasis on epidemiology, mechanisms of disease causation, prevention, and treatment.

BIOS 4400. Human Neuroanatomy. 3 Credit Hours.
The purpose of this course is to learn the anatomical makeup of the human nervous system. In this course we will closely examine details of central and peripheral neuroanatomy with links to function. As well, comparisons with non-human vertebrate neuroanatomy will be made.

BIOS 4401. Experimental Design and Statistical Methods in Biological Sciences. 3 Credit Hours.
Introductory course on experimental design, hypothesis testing and basic statistical techniques commonly applied in biosciences research. Exercises based on statistical software packages.

BIOS 4410. Microbial Ecology. 3 Credit Hours.
Advanced studies of microbial ecosystems, the specific roles of bacteria in maintaining ecological balance, and the evolution of the ecosystem in response to changing environments.

BIOS 4417. Marine Ecology. 3 Credit Hours.
An overview of the physical forces and biotic interactions structuring marine communities and of the major threats to these communities.

BIOS 4418. Microbial Physiology. 3 Credit Hours.
Study of the physiology of growth and metabolic activities of microorganisms.

BIOS 4428. Population Dynamics. 3 Credit Hours.
Students will examine the ecological factors that affect dynamics, regulation, and evolution of natural populations, emphasizing the connections with mathematical models, genetics, and ecology.

BIOS 4440. Human Pathology. 3 Credit Hours.
The course provides a comprehensive overview of clinical human anatomic pathology. The course will focus on select diseases and their etiologies, pathogenesis, morphological changes, and clinical manifestations.

BIOS 4460. Communicating Biological Research. 1 Credit Hour.
Students learn to convey the importance of research findings in the biological sciences and to critically evaluate research results through discussions and scientific presentations.

BIOS 4464. Developmental Biology. 3 Credit Hours.
Investigation of cell differentiation and development, using the tools of molecular genetics and cell biology.

BIOS 4471. Behavioral Biology. 3 Credit Hours.
An introduction to the study of the principles of behavior of all kinds of organisms, from microbes to mammals.

BIOS 4480. Evolutionary Developmental Biology – How to Build an Organism. 2 Credit Hours.
This course teaches students how the process of development from embryo to adult impacts evolutionary diversity and human health.

BIOS 4500. Drug Discovery. 3 Credit Hours.
You will learn about the drug discovery process by identifying a disease and disease target, and then design a therapy to treat the disease.

BIOS 4505. Programming in Biological and Life Sciences. 3 Credit Hours.
This course introduces students to the basics of coding, applied to fundamental biological and medical questions.

BIOS 4510. Epigenetics, Stem Cells, and Development. 3 Credit Hours.
This course will introduce the basic concepts and mechanisms in epigenetics, covering topics ranging from stem cell reprogramming, organismal development, social behaviors, to human diseases.

BIOS 4515. Community Ecology. 3 Credit Hours.
An advanced ecology course that covers classic and contemporary concepts, patterns, and processes in the field of community ecology.

BIOS 4520. Health Genes Society. 3 Credit Hours.
Capstone project based investigation of the roles that genes and culture play in shaping health, including an introduction to personalized medicine.

BIOS 4530. Human Evolutionary Genomics. 3 Credit Hours.
An advanced course where students will discuss primary literature and use computational tools to investigate how evolution has shaped global patterns of human genetic variation.

BIOS 4540. Human Motor Control. 3 Credit Hours.
Course provides in-depth review of biomechanics and neurophysiology of human motion and discusses how human movements are planned, executed and corrected by the nervous system.

BIOS 4545. Genetics of Complex Human Traits and Diseases. 3 Credit Hours.
Introduction to the genetics and evolution of complex human traits, focusing on contemporary approaches to understanding susceptibility to malignant, metabolic, immune and psychological diseases.

BIOS 4550. Origin of complex life: from cells to societies. 3 Credit Hours.
This course examines the evolutionary origins of complex life. We will examine the history of life on Earth and evolutionary process through which complexity arises.

BIOS 4560. RNA Biology and Biotechnology. 3 Credit Hours.
This course covers fundamental concepts of RNA biology as well as state-of-the-art biotechnologies that make use of RNA.

BIOS 4570. Immunology. 3 Credit Hours.
A survey of modern immunology and its applications.

BIOS 4590. Research Project Lab. 3 Credit Hours.
Experience in designing, implementing, and communicating a biology research project, and practical training in modern approaches for biological research.

BIOS 4607. Molecular Biology of Microbes: Disease, Nature, and Biotechnology. 3 Credit Hours.
Molecular genetics of bacteria with an emphasis on experimental approaches, regulatory mechanisms on disease-causing and environmental bacteria, and biotechnology applications derived from microbes.

BIOS 4620. Aquatic Chemical Ecology. 3 Credit Hours.
The course focuses on understanding the chemical mechanisms of aquatic signaling and the cascading effects on population regulation, community organization, and ecosystem function.

BIOS 4651. Bioethics. 3 Credit Hours.
This course examines important bioethical issues in research, policy, medicine, and the environment in light of ethical theory and the process of scientific inquiry.

BIOS 4668. Eukaryotic Molecular Genetics. 3 Credit Hours.
Topics in molecular genetics, including genetic engineering techniques, gene expression and regulation, gene structure, stability and evolution, with emphasis on eukaryotic organisms.

BIOS 4690. Independent Research Project. 3 Credit Hours.
Independent research with proposal and manuscript writing, conducted with the guidance of a faculty member.

BIOS 4691. Research Thesis. 3 Credit Hours.
Writing and submission of an Undergraduate Research Thesis describing research accomplishments with a Georgia Tech faculty member.

BIOS 4694. Biology Intern Assistantship. 1-21 Credit Hours.
Biology Undergraduate Internship for pay for juniors and seniors, by permit only. The internship experience must be at a unit or agency approved by the School of Biology.

BIOS 4695. Biology Internship. 1-21 Credit Hours.
Biology Undergraduate Internship for credit for juniors and seniors, by permit only. The internship experience must be at a unit or agency approved by the School of Biology.

BIOS 4696. Biology Undergraduate Teaching Assistantship. 3 Credit Hours.
Biology teaching carried out under the guidance of a faculty member.

BIOS 4697. Biology Undergraduate Teaching Experience. 3 Credit Hours.
An introduction to teaching biology for undergraduate teaching assistants, with a focus on effective teaching, active engagement of students, and development of innovative classroom activities.

BIOS 4698. Research Assistantship. 1-12 Credit Hours.
Undergraduate research under the guidance of a faculty member for juniors and seniors.

BIOS 4699. Undergraduate Research. 1-12 Credit Hours.
Undergraduate research under the guidance of a faculty member for juniors and seniors.

BIOS 4740. Biologically-Inspired Design. 3 Credit Hours.
We examine evolutionary adaptation as a source for engineering design inspiration, utilizing principles of scaling, adaptability, and robust multifunctionality that characterize biological systems.

BIOS 4744. Microbial Symbiosis & Microbiomes. 3 Credit Hours.
This course explores how symbiotic interactions with microbes affect the biology of other organisms, focusing extensively on the beneficial microbes native to the human body.

BIOS 4746. Signaling Molecules. 3 Credit Hours.
The diversity of chemical signals between organisms and their structural specifications will be presented along with chemical and biological methods for isolating signaling molecules.

BIOS 4801. Special Topics. 1 Credit Hour.
Special Topics.

BIOS 4802. Special Topics. 2 Credit Hours.
Special Topics in the School of Biological Sciences.

BIOS 4803. Special Topics. 3 Credit Hours.
Special Topics.

BIOS 4813. Special Topics. 3 Credit Hours.
Special Topics.

BIOS 4814. Special Topics. 4 Credit Hours.
This designation enables the School of Biology to provide new lecture courses dealing with areas of current interest in biological science.

BIOS 4835. Special Topics. 3 Credit Hours.
Special Topics offered by the School of Biological Sciences.

BIOS 4XXX. Biological Sciences Elective. 1-21 Credit Hours.

BIOS 8802. Special Topics. 2 Credit Hours.

Biomedical Engineering (BMED)

BMED 1000. Introduction to Biomedical Engineering. 1 Credit Hour.
An introduction to the field of biomedical engineering, with an emphasis on career preparation.

BMED 1300. Problems in Biomedical Engineering I. 3 Credit Hours.
Biomedical engineering problems from industrial and clinical applications are addressed and solved in small groups using problem-based learning methodologies.

BMED 1750. Introduction to Bioengineering. 3 Credit Hours.
An introduction to the field of bioengineering, including the application of engineering principles and methods to problems in biology and medicine, the integration of engineering with biology, and the emerging industrial opportunities. Crosslisted with AE, CHE, ECE, ME, and MSE 1750.

BMED 1801. Special Topics. 1 Credit Hour.
Courses in special topics of current interest not included in the regular course offerings.

BMED 1802. Special Topics. 2 Credit Hours.
Courses in special topics of current interest not included in the regular course offerings.

BMED 1803. Special Topics. 3 Credit Hours.
Courses in special topics of current interest not included in the regular course offerings.

BMED 1804. Special Topics. 4 Credit Hours.
Courses in special topics of current interest not included in the regular course offerings.

BMED 1805. Special Topics. 5 Credit Hours.
Courses in special topics of current interest not included in the regular course offerings.

BMED 1811. Special Topics. 1 Credit Hour.
Courses in special topics of current interest not included in the regular course offerings.

BMED 1812. Special Topics. 2 Credit Hours.
Courses in special topics of current interest not included in the regular course offerings.

BMED 1813. Special Topics. 3 Credit Hours.
Courses in special topics of current interest not included in the regular course offerings.

BMED 1814. Special Topics. 4 Credit Hours.
Courses in special topics of current interest not included in the regular course offerings.

BMED 1815. Special Topics. 5 Credit Hours.
Courses in special topics of current interest not included in the regular course offerings.

BMED 1XXX. Bioengineering Elective. 1-21 Credit Hours.

BMED 2110. Conservation Principles in Biomedical Engineering. 3 Credit Hours.
A study of material and energy balances applied to problems in biomedical engineering.

BMED 2250. Problems in Biomedical Engineering. 3 Credit Hours.
Biomedical engineering problems from industrial and clinical applications are addressed and solved in small groups using problem-based learning methodologies. Credit will not be awarded for both BMED 2250 and BMED 1300.

BMED 2300. Problems in Biomedical Engineering II. 3 Credit Hours.
Biomedical engineering problems from industrial and clinical applications are addressed and solved in small groups using problem-based learning methods.

BMED 2310. Intro to Biomedical Engineering Design. 3 Credit Hours.
In small teams students will apply problem-based learning and human centered design to reverse engineer, analyze, and redesign medical devices. Credit will not be awareded for both BMED 2310 and BMED 2300.

BMED 2400. Introduction to Bioengineering Statistics. 3 Credit Hours.
Introduction to statistical modeling and data analysis in bioscientific and bioengineering applications. Topics include estimation, testing, regression, and experimental design.

BMED 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

BMED 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

BMED 2801. Special Topics. 1 Credit Hour.
Courses in special topics of current interest not included in the regular course offerings.

BMED 2802. Special Topics. 2 Credit Hours.
Courses in special topics of current interest not included in the regular course offerings.

BMED 2803. Special Topics. 3 Credit Hours.
Courses in special topics of current interest not included in the regular course offerings.

BMED 2804. Special Topics. 4 Credit Hours.
Courses in special topics of current interest not included in the regular course offerings.

BMED 2805. Special Topics. 5 Credit Hours.
Courses in special topics of current interest not included in the regular course offerings.

BMED 2811. Special Topics. 1 Credit Hour.
Courses in special topics of current interest not included in the regular course offerings.

BMED 2812. Special Topics. 2 Credit Hours.
Courses in special topics of current interest not included in the regular course offerings.

BMED 2813. Special Topics. 3 Credit Hours.
Courses in special topics of current interest not included in the regular course offerings.

BMED 2814. Special Topics. 4 Credit Hours.
Courses in special topics of current interest not included in the regular course offerings.

BMED 2815. Special Topics. 5 Credit Hours.
Courses in special topics of current interest not included in the regular course offerings.

BMED 2XXX. Bioengineering Elective. 1-21 Credit Hours.

BMED 3100. Systems Physiology. 3 Credit Hours.
An introduction to human physiology emphasizing biomedical engineering aproaches to the understanding of basic organ function, disease states, and medical intervention.

BMED 3101. Introduction to Biomedical Data Science and Engineering. 3 Credit Hours.
Practical/hands-on experience in performing biomedical-related data processing/computation/analysis with a variety of computer tools, platforms, and applications.

BMED 3110. Quantitative Engineering Physiology Laboratory I. 2 Credit Hours.
A hands-on lab providing an active learning team environment to reinforce selected engineering principles of physiology, emphasizing a quantitative model-oriented approach to physiological systems.

BMED 3300. Biotransport. 4 Credit Hours.
Fundamental principles of fluid, heat, and mass transfer with particular emphasis on physiological and biomedical systems.

BMED 3310. Biotransport. 3 Credit Hours.
Fundamental principles of fluid, heat, and mass transfer with particular emphasis on physiological and biomedical systems. Credit will not be awarded for both BMED 3310 and BMED 3300.

BMED 3400. Introduction to Biomechanics. 4 Credit Hours.
An introduction to the basic concepts and methods in biomechanics, including statistics and the mechanics of biomaterials. The biomedical applications of mechanics will be illustrated.

BMED 3410. Introduction to Biomechanics. 3 Credit Hours.
Introduces concepts and approaches for biomedical deformation and dynamics problems using the application of simple models from statics, mechanics of materials, kinematics, and dynamics.

BMED 3500. Biomedical Sensors and Instrumentation. 3 Credit Hours.
A study of basic concepts and design of electronic sensors and instrumentation used in biomedical measurements. Standard clinical measurement techniques will also be examined.

BMED 3510. Biomedical Systems and Modeling. 4 Credit Hours.
Basic concepts, modeling tools and analysis techniques for the study of biochemical, bioelectrical and biomedical systems.

BMED 3520. Biomedical Systems and Modeling. 3 Credit Hours.
Introduction of computational systems biology, including the modeling process, various types of models, standard analysis and simulation of systems, and applications in real-world biological systems. Credit will not be awarded for both BMED 3520 and BMED 3510.

BMED 3600. Physiology of Cellular and Molecular Systems. 3 Credit Hours.
In depth cell and molecular physiology focused on cellular responses to stimuli, including cell organization/ reorganization, membrane transport/ kinetics, cell signaling/ molecular biology, mechanobiology and energy requirements.

BMED 3610. Quantitative Engineering Physiology Laboratory II. 2 Credit Hours.
This lab provides an active learning team environment, incorporating common cell/molecular biology techniques, to reinforce selected engineering principles in an in vitro cell culture setting.

BMED 3801. Special Topics. 1 Credit Hour.

BMED 3802. Special Topics. 2 Credit Hours.
Special Topics in Biomedical Engineering.

BMED 3811. Special Topics. 1 Credit Hour.

BMED 3853. Special Topics. 3 Credit Hours.
Special topics in BMED.

BMED 3XXX. Bioengineering Elective. 1-21 Credit Hours.

BMED 4000. The Art of Telling Your Story. 1 Credit Hour.
Students will create a professional portfolio and develop the ability to pitch themselves to an audience to prepare themselves to begin their professional careers.

BMED 4400. Neuroengineering Fundamentals. 4 Credit Hours.
Lab and lecture on current topics in Neuroengineering, including electrophysiology, clinical and diagnostic neuroengineering, neural prosthetics, sensory-motor integration, neuromorphic VLSI, neurodynamics and neurorobotics.

BMED 4477. Biological Networks and Genomics. 3 Credit Hours.
Introduction to modeling of biological networks involved in gene regulation, cell signaling and metabolism. Mathematical modeling of cellular processes, such as gene expression, using genomic data.

BMED 4500. Cell and Tissue Engineering Laboratory. 3 Credit Hours.
The principles of cell and tissue engineering will be presented as a laboratory course to give students a hands-on experience. Cell engineering topics include receptor/ligand interactions, cell cycle/ metabolism, cell adhesion, cellular mechanics, cell signal transduction, and cell transfection. Tissue engineering topics include applications, biomaterials/scaffolds and cells for reparative medicine, bioreactors and bioprocessing, functional assessment, in vivo issues.

BMED 4600. Senior Design Project I. 2 Credit Hours.
Team-oriented major design project in biomedical engineering, incorporating engineering standards and realistic design constraints. Credit not allowed for BMED 4600 and BMED 4603 (or BMED 4601).

BMED 4601. Senior Design Project II. 3 Credit Hours.
Team-oriented major design project in biomedical engineering, incorporating engineering standards and realistic design constraints. Credit not allowed for both BMED 4601 and BMED 4603 (or BMED 4600).

BMED 4602. Capstone Design. 3 Credit Hours.
Team-oriented design project in biomedical engineering, incorporating engineering standards and realistic design constraints. Includes introduction to relevant regulatory, intellectual property, and business management topics.

BMED 4603. Advanced Design. 3 Credit Hours.
Continuation of a team-oriented design experience initiated in BMED 4602 Capstone Design. Includes more advanced relevant regulatory. intellectual property, and business management topics. Credit not allowed for both BMED 4603 and BMED 4600 (or BMED 4601).

BMED 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

BMED 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

BMED 4723. Interdisciplinary Capstone Design. 3 Credit Hours.
Interdisciplinary Capstone Design, Industry projects or CREATE-X section.

BMED 4739. Medical Robotics. 3 Credit Hours.
An interdisciplinary course focusing on fundamental understanding of robot kinematics and dynamics as well as the design, development, and evaluation of a medical robotic system.

BMED 4740. Biologically Inspired Design. 3 Credit Hours.
We examine evolutionary adaptation as a source for engineering design inspiration, utilizing principles of scaling, adaptability, and robust multifunctionality that characterize biological systems.

BMED 4750. Diagnostic Imaging Physics. 3 Credit Hours.
Physics and image formation methods for conventional X-ray, digital X-ray CT, nuclear medicine, and magnetic resonance and ultrasound imaging. Crosslisted with MP 4750 and NRE 4750.

BMED 4751. Introduction to Biomaterials. 3 Credit Hours.
Introduction to different classes of biomaterials (polymers, metals, ceramics) and physiological responses to biomaterial implantation. Topics include material properties, host response, and biomaterial characterization techniques. Crosslisted with MSE 4751.

BMED 4752. Introductory Neuroscience. 3 Credit Hours.
Goals are to understand the components of the nervous system and their functional interactions, and appreciate the complexity of higher order brain functions and pathways. Crosslisted with BIOL 4752.

BMED 4757. Biofluid Mechanics. 3 Credit Hours.
Introduction to the study of blood flow in the cardiovascular system. Emphasis on modeling and the potential of flow studies for clinical research application. Crosslisted with AE, CHE and ME 4757.

BMED 4758. Biosolid Mechanics. 3 Credit Hours.
The mechanics of living tissue, e.g., arteries, skin, heart muscle, ligament, tendon, cartilage, and bone. Constitutive equations and some simple mechanical models. Mechanics of cells. Applications. Crosslisted with AE, CHE, and ME 4758.

BMED 4765. Drug Design, Development and Delivery. 3 Credit Hours.
Introduction to the pharmaceutical development process, including design of new drugs, synthesis and manufacturing issues, and methods for delivery into the body. Includes student presentations. Crosslisted with CHEM and CHBE 4765.

BMED 4781. Biomedical Instrumentation. 3 Credit Hours.
A study of medical instrumentation from a systems viewpoint. Pertinent physiological and electro-physiological concepts will be covered. Credit not allowed for both BMED 4781 and (CHE 4781 or ME 4781 or CHBE 4781 or ECE 4781).

BMED 4782. Biosystems Analysis. 3 Credit Hours.
Analytical methods for modeling biological systems, including white-noise protocols for characterizing nonlinear systems. Crosslisted with CHE, ECE, and ME 4782.

BMED 4783. Introduction to Medical Image Processing. 3 Credit Hours.
A study of mathematical methods used in medical image acquisition and processing. Concepts, algorithms, and methods associated with acquisition, processing, and display of two- and three-dimensional medical imaged are studied. Crosslisted with ECE 4783.

BMED 4784. Engineering Electrophysiology. 3 Credit Hours.
Basic concepts of electrophysiology from an engineering perspective. Functionality of relevant organs and systems; instrumentation tools which monitor electrophysiology function. Crosslisted with ECE 4784.

BMED 4801. Special Topics. 1 Credit Hour.
Courses in special topics of current interest not included in the regular course offerings.

BMED 4802. Special Topics. 2 Credit Hours.
Courses in special topics of current interest not included in the regular course offerings.

BMED 4803. Special Topics. 3 Credit Hours.
Courses in special topics of current interest not included in the regular course offerings.

BMED 4804. Special Topics. 4 Credit Hours.
Courses in special topics of current interest not included in the regular course offerings.

BMED 4805. Special Topics. 5 Credit Hours.
Courses in special topics of current interest not included in the regular course offerings.

BMED 4811. Special Topics. 1 Credit Hour.
Courses in special topics of current interest not included in the regular course offerings.

BMED 4812. Special Topics. 2 Credit Hours.
Courses in special topics of current interest not included in the regular course offerings.

BMED 4813. Special Topics. 3 Credit Hours.
Courses in special topics of current interest not included in the regular course offerings.

BMED 4814. Special Topics. 4 Credit Hours.
Courses in special topics of current interest not included in the regular course offerings.

BMED 4815. Special Topics. 5 Credit Hours.
Courses in special topics of current interest not included in the regular course offerings.

BMED 4823. Special Topics. 3 Credit Hours.
Courses in special topics of current interest not included in the regular course offerings.

BMED 4833. Special Topics. 3 Credit Hours.
Courses in special topics of current interest not included in the regular course offerings.

BMED 4843. Special Topics. 3 Credit Hours.
Courses in special topics of current interest not included in the regular course offerings.

BMED 4853. Special Topics. 3 Credit Hours.

BMED 4863. Special Topics. 3 Credit Hours.

BMED 4873. Special Topics. 3 Credit Hours.

BMED 4883. Special Topics. 3 Credit Hours.

BMED 4893. Special Topics. 3 Credit Hours.
Special Topics in BMED.

BMED 4900. Special Problems. 1-21 Credit Hours.
Individualized studies in certain specialized areas of interest in biomedical engineering.

BMED 4901. Special Problems. 1-21 Credit Hours.
Individualized studies in certain specialized areas of interest in biomedical engineering.

BMED 4902. Special Problems. 1-21 Credit Hours.
Individualized studies in certain specialized areas of interest in biomedical engineering.

BMED 4903. Special Problems. 1-21 Credit Hours.
Individualized studies in certain specialized areas of interest in biomedical engineering.

BMED 4XXX. Bioengineering Elective. 1-21 Credit Hours.

BMED 6041. Analytical Methods for Biomedical Engineering. 3 Credit Hours.
Basic analytical approaches to solve mathematical problems involved in biomedical engineering applications. Course focuses on ordinary and partial differential equations and on integral transform methods.

BMED 6042. Systems Physiology. 3 Credit Hours.
Regulation of physiological functions in the cardio-respiratory-renal, musculoskeletal, and gastrointestinal systems, and their interactions with the neural, endocrine, and immune systems.

BMED 6210. Magnetic Resonance Imaging. 3 Credit Hours.
This course covers the basic physics and engineering principles, advanced techniques and major applications of magnetic resonance imaging.

BMED 6501. Fundamentals of Biomedical Innovation and Development Processes. 3 Credit Hours.
Key steps, multiple stakeholders and interdependencies in the design and commercialization process for medical products.

BMED 6502. BioID Clinical Literacy and Experience. 3 Credit Hours.
Education in interfacing with medical healthcare professionals, medical terminology, on-site clinical observations, needs-finding, case analysis, creating design solutions for improved methods, products and procedures.

BMED 6503. Medical Markets and Clinical Specialties. 3 Credit Hours.
Introduction to medical device and biologics industries, interdependencies of commercial companies, vendors and suppliers required for development, commercialization and sales of products and equipment.

BMED 6504. Financial Planning for Development Projects. 3 Credit Hours.
Finance planning for development projects including: costing, forecasting, time value of money, breakeven analysis, return on investment analysis, capital budgeting, risk and return, working capital management.

BMED 6505. Product Planning and Project Management. 3 Credit Hours.
Strategy and analysis techniques to evaluate and manage new product innovations, product improvements and product line extensions in context of an entity's mission and goals.

BMED 6506. Professional Communications for Biomedical Innovation and Development. 3 Credit Hours.
Techniques and practice of effective oral presentations project/grant proposal writing, technical and project report writing to support medical device engineering, design and business.

BMED 6507. Medical Device Regulatory Requirements. 3 Credit Hours.
FDA Regulations for medical devices including clearance-approval pathways to commercialization, Quality Systems Regulations and ISO Standards for medical devices in the European Economic Community.

BMED 6508. BioID Team Masters Project I. 3 Credit Hours.
Team project to address an unmet medical need and develop an innovative solution including the engineering design document package and proof-of-concept prototyhpe.

BMED 6509. BioID Masters Project II. 6 Credit Hours.
Teams will construct prototypes for Course I biomedical device project solution, conduct and analyze performance testing, prepare FDA 510(k) submission, and prepare project commercialization plan.

BMED 6517. Machine Learning in Biosciences. 3 Credit Hours.
Introduces machine learning concepts and methods, including supervised and unsupervised learning, dimension reduction and visualization. Topics are accompanied by bioinformatics and systems biology applications.

BMED 6700. Biostatistics. 3 Credit Hours.
An introduction to fundamental ideas and techniques in Biostatistics, with an emphasis on conceptual understanding and on the analysis of real data sets.

BMED 6710. Rational Design of Biomaterials. 3 Credit Hours.
The goal of this course is to give graduate students the ability to rationally design new biomaterials by integrating organic chemistry concepts with molecular biology.

BMED 6711. Rational Design of Biomaterials Lab. 3 Credit Hours.
The goal of this course is to teach students the laboratory skills needed to design and synthesize new biomaterials.

BMED 6720. Biotransport. 3 Credit Hours.
This graduate level course covers the analysis of fluid flow phenomena in the human body, cardiovasculature, respiratory system and other organ systems.

BMED 6730. Materials Science of Cellular Components. 3 Credit Hours.
Addresses structure-property relationship of cellular components. Credit not allowed for both BMED 6730 and MSE 6730.

BMED 6739. Medical Robotics. 3 Credit Hours.
This interdisciplinary course focuses on a fundamental understanding of robot kinematics and dynamics as well as the design, development, and evaluation of a medical robotic system.

BMED 6740. Living System Modeling & Analysis. 3 Credit Hours.
The purpose of this course is to introduce graduate students to living system models as pre-clinical test beds for a wide variety of biotechnologies.

BMED 6743. Biosolid Mechanics. 3 Credit Hours.
Structure-function relationships and constitutive models for a variety of biological tissues, with an emphasis on understanding the mechanical behaviors of normal and pathological tissues. Credit not given for both BMED/ME 6783 and BMED/ME 6743. Crosslisted with ME 6743.

BMED 6753. Principles of Management for Engineers. 3 Credit Hours.
The course will provide an introduction to selected topics needed to be successful in the technology industries. Cannot count toward major area requirements in M.S. or Ph.D. programs of study.

BMED 6760. Information Processing Models in Neural Systems. 3 Credit Hours.
This course will examine "top down" modeling approaches for sensorineural systems, where an optimal computational principle used in engineering (e.g., information theory, Bayesian inference, control theory) explains observed information processing.

BMED 6765. Drug Design, Development and Delivery. 3 Credit Hours.
Introduction to the pharmaceutical development process, including design of new drugs, synthesis and manufacturing issues, and methods of delivery into the body. Includes student presentations. Crosslisted with BMED 6765 and CHBE 6765.

BMED 6774. Biomaterials: Structure and Function. 3 Credit Hours.
Structure-function relationships of biomaterials and biomaterial characterization will be covered. Materials for medial implants, tissue engineering, biosensing, imaging, and drug delivery will be covered. Crosslisted with CHE, ME, and MSE 6774.

BMED 6777. Advanced Biomaterials. 3 Credit Hours.
Advanced topics of biomaterials performance and engineering, including biointerfaces, host reactions to materials, and bio-inspired/smart-materials strategies. Crosslisted with CHE, ME, and MSE 6777.

BMED 6779. Bioprocess Engineering. 3 Credit Hours.
Study of enzymes and microbial and mammalian cells for production of biochemicals and protein therapeutics in bioreactors; downstream separation and purification; integrated view of bioprocesses. Crosslisted with CHE 6779.

BMED 6780. Medical Image Processing. 3 Credit Hours.
A study of methods for enhancing, analyzing, interpreting, and visualizing information from two- and three-dimensional data obtained from a variety of medical imaging modalities. Crosslisted with ECE and CS 6780.

BMED 6782. Cellular Engineering. 3 Credit Hours.
Engineering analysis of cellular systems. Crosslisted with CHE and ME 6782.

BMED 6784. Cardiovascular Biomechanics. 3 Credit Hours.
Mechanical analysis of the cardiovascular system emphasizing the normal and pathologic function in relation to clinical cardiovascular medicine. Crosslisted with CHE and ME 6784.

BMED 6786. Medical Imaging Systems. 3 Credit Hours.
A study of the principles and design of medical imaging systems such as X-ray, ultrasound, nuclear medicine, and nuclear magnetic resonance. Crosslisted with ECE 6786.

BMED 6787. Quantitative Electrophysiology. 3 Credit Hours.
A quantitative presentation of electrophysiological systems in biological organisms, emphasizing the electrical properties and modeling of neural and cardiac cells and systems. Crosslisted with PHYS and ECE 6787.

BMED 6789. Technology Ventures. 3 Credit Hours.
Team discussion and case studies in biomedical engineering technology transfer, including licensing, financial capital, safety and efficacy studies, clinical trials, and strategic planning. Crosslisted with ECE, CHE, ME, and MGT 6789.

BMED 6790. Information Processing Models in Neural Systems. 3 Credit Hours.
Examines "top-down" modeling approaches for sensorineural systems, where optimal computational principles used in engineering(e.g., information theory, Bayesian inference, control theory) explain observed information processing.

BMED 6793. Systems Pathophysiology. 3 Credit Hours.
Overview of human pathophysiology from a quantitative perspective. A brief introduction to the application of quantitative models to the understanding of biological systems. Crosslisted with CHE, ECE, and ME 6793.

BMED 6794. Tissue Engineering. 3 Credit Hours.
Biological, engineering, and medical issues in developing tissue engineered constructs. Emphasis in the integration of these disciplines at a basic molecular and cell biology level. Crosslisted with CHE and ME 6794.

BMED 6799. Legal Issues in Technology Transfer. 3 Credit Hours.
Study and analysis of U.S. law as it applies to the patenting and licensing processes. Crosslisted with CHE, ME, and MGT 6799.

BMED 6XXX. Bioengineering Elective. 1-21 Credit Hours.

BMED 7000. Master's Thesis. 1-21 Credit Hours.

BMED 7001. Biomedical Engineering Seminar. 1 Credit Hour.
Graduate students of the Biomedical Engineering department (all programs) participate in seminars involving current research projects presented by faculty and invited speakers.

BMED 7002. Teaching Practicum I. 1 Credit Hour.
This course provides discipline-specific training that addresses intellectual problems and teaching strategies from the perspective of the discipline. Credit not allowed for both BMED 7002 and BMED 8696.

BMED 7003. Teaching Practicum II. 1 Credit Hour.
This course provides discipline-specific training that addresses intellectual problems and teaching strategies from the perspective of the discipline. Credit not allowed for both BMED 7003 and BMED 8697.

BMED 7004. Teaching & Research Practicum I. 1 Credit Hour.
This course provides the practicial framework for understanding challenges faced during teaching, research, and academic life. This course includes topical materials required for BME RCR requirements.

BMED 7005. Teaching & Research Practicum II. 1 Credit Hour.
This course provides the practical framework for understanding challenges faced during teaching, research, and academic life.

BMED 7011. Integrative Core: Introduction to Modeling and Experimentation in Biomedical Engineering. 3 Credit Hours.
An introduction to how engineers approach problems - via conceptual models that are then used to create wet lab models and in silico models.

BMED 7012. Integrative Core: Experimental Design-Measurements at the Right Spatial and Temporal Scales. 3 Credit Hours.
This integrative core course focuses on the design of experiments to answer scientific questions, with an emphasis on the spatial and temporal scales of measurements.

BMED 7013. Integrative Core: Problem Solving with Computational Models. 3 Credit Hours.
An introduction to computational model methodologies for complex biomedical/biological systems. Emphasis is placed on developing well-posed scientific hypotheses through the use of simulations.

BMED 7101. Advanced Seminar: Biomaterials & Regenerative Medicine. 3 Credit Hours.
This course is intended to promote critical review of the "State-of-the-art" biomaterial technologies to identify knowledge gaps that must be overcome to further biomaterials development.

BMED 7201. Advanced Seminar: Cardiovascular Biology & Biomechanics. 3 Credit Hours.
To review current topics in cardiovascular engineering, biology and diseases through critical literature review. In addition, each student will develop and present a "Proposal" by the end of the class.

BMED 7301. Advanced Seminar: Cellular & Biomolecular Engineering. 3 Credit Hours.
This seminar course illustrates the development of micro- and nano-scale engineering approaches for studies of biomoleculles and cells and their applications to medicine.

BMED 7310. Stem Cell Engineering. 3 Credit Hours.
Fundamentals for the application of analytical engineering approaches to the quantitative study of stem cell biology and translation into cell therapies and diagnostics.

BMED 7410. Introduction to Multiscale Analysis in Systems. 3 Credit Hours.
The class explores modeling analyses spanning multiple levels of biological organization at different resolutions of detail. Emphasis is placed on control in complex biological systems.

BMED 7411. Mathematical Models in Biology & Medicine. 3 Credit Hours.
The course introduces the student to a representative set of models that elucidate the nature of biological and medical phenomena.

BMED 7413. Biochemical Systems Analysis. 3 Credit Hours.
The course introduces BME students interested in mathematical modeling and systems biology to the computational analysis of metabolic and other dynamic systems in biology.

BMED 7601. Advanced Seminar: Neuroengineering and Neuropathology. 3 Credit Hours.
Current issues in neuroengineering. Focus is placed on neuropathological complexity across cellular and organ level scales through literature reading, discussion, and independent study.

BMED 7610. Quantitative Neuroscience. 3 Credit Hours.
A quantitative presentation of neural signal processing and information coding, emphasizing the circuitry of sensory and motor pathways of the brain.

BMED 7741. Robotics Professional Preparation. 1 Credit Hour.
Preparation for a professional career in Robotics. Local & visiting speakers. Program introduction. Technical resume preparation. GT Robotics labs & resources.

BMED 7742. Robotics Professional Preparation 2. 1 Credit Hour.
Preparation for a professional career in Robotics. Local & visiting speakers. Selecting and applying for Internship. Developing capstone project proposal. Public speaking practice and preparation.

BMED 7743. Robotics Professional Preparation 3. 1 Credit Hour.
Preparation for a professional career in Robotics. Local & visiting speakers. Interview preparation & career search. Technical report writing and presentation.

BMED 7785. Introduction to Robotics Research. 3 Credit Hours.
Familiarizes students with the core of robotics: mechanics, control, perception, AI, and autonomy. Provides an introduction to the mathematical tools required in robotics research. Cross-listed with AE 7785, ECE 7785, and CS 7785.

BMED 8740. Robotics Internship. 1-21 Credit Hours.
Graduate Internship at a partner company, GTRI or a GT Robotics lab.

BMED 8741. Robotics Capstone Project. 3 Credit Hours.
Teams or individuals apply the knowledge and skills acquired throughout the MS program to a faculty supervised robotics project.

BMED 8750. Multidisciplinary Robotics Research I. 3 Credit Hours.
Multidisciplinary research course supervised by two robotics faculty from different schools participating in the robotics Ph.D. program. Cross-listed with AE, CS, and ECE 8750.

BMED 8751. Multidisciplinary Robotics Research II. 3 Credit Hours.
Continuation of BMED 8750 (Multidisciplinary Robotics Research I). Cross-listed with AE, CS, and ECE 8751.

BMED 8811. Special Topics. 1 Credit Hour.
Topics of current interest in biomedical engineering.

BMED 8812. Special Topics. 2 Credit Hours.
Topics of current interest in biomedical engineering.

BMED 8813. Special Topics. 3 Credit Hours.
Topics of current interest in biomedical engineering.

BMED 8814. Special Topics. 4 Credit Hours.
Topics of current interest in biomedical engineering.

BMED 8815. Special Topics. 5 Credit Hours.
Topics of current interest in biomedical engineering.

BMED 8823. Special Topics. 3 Credit Hours.
Topics of current interest in biomedical engineering.

BMED 8833. Special Topics. 3 Credit Hours.
Special Topics.

BMED 8843. Special Topics. 3 Credit Hours.
Special Topics.

BMED 8853. Special Topics. 3 Credit Hours.
Topics of current interest in biomedical engineering.

BMED 8901. Special Problems. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in bioengineering.

BMED 8902. Special Problems. 1-21 Credit Hours.

BMED 8903. Special Problems. 1-21 Credit Hours.

BMED 8997. Teaching Assistantship. 1-9 Credit Hours.
For graduate students holding a teaching assistantship.

BMED 8998. Research Assistantship. 1-9 Credit Hours.
For graduate students holding a research assistantship.

BMED 9000. Doctoral Thesis. 1-21 Credit Hours.

Biomed Engr/Joint Emory PKU (BMEJ)

BMEJ 9999. GT-PKU. 12 Credit Hours.
For GT, PKU, and Emory students during terms when they are not taking other GT courses. Placeholder course.

Biomedical Engr/Joint Emory (BMEM)

BMEM 6000. Biomedical Engineering Joint Program with Emory. 1-21 Credit Hours.

BMEM 6001. BMED Eng-Joint w/Emory. 1-21 Credit Hours.

Civil and Environmental Engr (CEE)

CEE 1770. Introduction to Engineering Graphics and Visualization. 3 Credit Hours.
Engineering graphics and visualization including sketching, line drawing, and solid modeling.Development and interpretation of drawings and specification for product realization. Crosslisted with AE and ME 1770.

CEE 1XXX. Civil and Environmental Engineering Elective. 1-21 Credit Hours.

CEE 2040. Dynamics. 2 Credit Hours.
Kinematics and kinetics of particles and rigid bodies in one and two dimensions; principles of work/energy and impulse/momentum.

CEE 2300. Environmental Engineering Principles. 3 Credit Hours.
Introduction to chemical, biological, and physical processes in the environment. Discussion of the basic processes governing air, water, and land quality, and the behavior and impacts of contaminants associated with human and industrial activities.

CEE 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

CEE 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

CEE 2803. Special Topics. 3 Credit Hours.

CEE 2812. Special Topics. 2 Credit Hours.
Special Topics in CEE.

CEE 2901. Special Problems. 1-21 Credit Hours.

CEE 2XXX. Civil and Environmental Engineering Elective. 1-21 Credit Hours.

CEE 3000. Civil Engineering Systems. 3 Credit Hours.
Infrastructure viewed from a systems perspective; analytical approaches and modeling of civil-engineered facilities; sustainability; engineering economy applications.

CEE 3010. Geomatics. 3 Credit Hours.
Spatial data collection methods including surveying, photogrammetry, remote sensing, and global positioning systems; management, manipulation, and analysis of spatial and associated attribute data.

CEE 3020. Civil Engineering Materials. 3 Credit Hours.
Physical, mechanical, and durability properties of concrete, metals, unreinforced and reinforced plastics, timber, asphalt, and asphalt concrete.

CEE 3040. Fluid Mechanics. 3 Credit Hours.
Elementary mechanics of fluids with emphasis on hydrostatics, control volume analysis of flowing fluids using kinematics, continuity, energy, and momentum principles; similitude, pipe flow.

CEE 3051. Introduction to Structural Engineering. 3 Credit Hours.
Concepts in structural engineering related to the analysis and design of various types of structures such that they behave as intended throughout their lifetime.

CEE 3052. Introduction to Structural Engineering for the Global Engineering Leadership Minor. 3 Credit Hours.
Concepts in structural engineering related to the analysis and design of various types of structures such that they behave as intended throughout their lifetime.

CEE 3055. Structural Analysis. 3 Credit Hours.
Determination of internal forces and deflection in statically determinate trusses, beams, and frames. Introduction to analysis of statically indeterminate structures.

CEE 3340. Environmental Engineering Laboratory. 3 Credit Hours.
Theory and application of environmental laboratory methods for measurement of fundamental properties and characteristics of dissolved and particulate constituents in water, air and soil systems.

CEE 3400. Introduction to Geotechnical Engineering. 3 Credit Hours.
Introduction to soil as an engineering material, with a focus on the mechanics of soil strength and compressibility, and fluid flow through soils.

CEE 3770. Statistics and Applications. 3 Credit Hours.
Introduction to probability, probability distributions, point estimation, confidence intervals, hypothesis testing, linear regression, and analysis of variance. Example applied to the field of civil and environmental engineering. Crosslisted with MATH 3770 and ISYE 3770. Also, credit not awarded for both CEE 3770 and MATH 3670.

CEE 3XXX. Civil and Environmental Engineering Elective. 1-21 Credit Hours.

CEE 4000. Global Engineering Leadership. 3 Credit Hours.
Addresses skills necessary for the global engineer-leader. creating an engineering firm and evaluating its global viability; written, oral, and cross-cultural communication; collaboration; ethics; strategic planning.

CEE 4005. Innovation & Entrepreneurship in CEE Systems. 3 Credit Hours.
This course highlights opportunities for innovation and entrepreneurship in Civil and Environmental Engineering Systems, and the essential components of forming, pitching, and starting a business.

CEE 4050. Infrastructure System Management. 3 Credit Hours.
Introduction to general concepts and advanced topics in infrastructure systems management applied to manage large-scale infrastructure assets.

CEE 4090. Capstone Design. 3 Credit Hours.
An interdisciplinary civil and environmental design experience. Problem definition, data acquisition, modeling and analysis, evaluation of design alternatives, oral and written presentation of final design.

CEE 4100. Construction Engineering and Management. 3 Credit Hours.
Fundamental concepts in planning, design, and construction of civil engineering projects. Introduction to project scheduling, cost estimating, controls, procurement, value engineering, quality assurance, and safety.

CEE 4101. Construction Seminar. 1 Credit Hour.
The seminar provides a platform for students to engage with construction industry companies and experts, to learn about different construction disciplines, their projects, and experiences.

CEE 4110. Construction Planning, Estimating, and Scheduling. 3 Credit Hours.
An integrated approach to planning, estimating, and scheduling of construction projects, including basic and advanced concepts, applications, and tools for developing plans, estimates, and schedules.

CEE 4120. Construction Operations. 3 Credit Hours.
An integrated approach to construction methods, including basic and advanced concepts, applications, and tools for planning, analysis, and assessment of construction methods and equipment.

CEE 4130. Construction Safety and Health. 3 Credit Hours.
Fundamentals to safety and health as they apply to civil infrastructure and building construction. Topics include planning, design, management, rules and guidelines, best practices, and inspection of safety and health.

CEE 4140. Building Information Modeling (BIM) in Construction. 3 Credit Hours.
Theory and Application of Building Information Modeling (BIM) in the Architecture/Engineering/Construction (A/E/C) industry with emphasis on Constructability, Scheduling. Front End Planning (FEP) and Construction monitoring.

CEE 4150. Construction Management & Megaprojects. 3 Credit Hours.
Covers planning and development of megaprojects. Addresses social, environmental, and economic impacts of megaprojects. Discusses cultural differences & ethical issues in managing megaprojects.

CEE 4160. Smart and Sustainable Cities. 3 Credit Hours.
This course examines city infrastructure systems' impact on urban sustainability. It further explores the role of "smart" technological solutions to address mounting urban sustainability challenges.

CEE 4170. Construction Law. 3 Credit Hours.
Overview includes legal concepts, the mechanics of the judicial system, professional liability and other legal issues as they pertain to construction engineers.

CEE 4200. Hydraulic Engineering. 3 Credit Hours.
Applications of fluid mechanics to engineering and natural systems including fluid drag, open channel flow, turbomachinery, and environmental hydraulics; laboratory experiments; computational hydraulics.

CEE 4210. Hydrology. 3 Credit Hours.
Global circulation and the hydrologic cycle, precipitation mechanisms and analysis, evaporation and other losses, streamflow, hydrographs, river and reservoir routing, and frequency analysis.

CEE 4211. Water Resources Systems. 3 Credit Hours.
Components and services of water resources systems; and planning and management approaches in the face of climatic, environmental, and socio-economic change.

CEE 4225. Introduction to Coastal Engineering. 3 Credit Hours.
Introduction to coastal engineering processes and problems. Topics include: water wave mechanics, nearshore hydrodynamics, astronomical tides, sediment transport, beach nourishment, and coastal structures.

CEE 4300. Environmental Engineering Systems. 3 Credit Hours.
Environmental engineering issues associated with water, air, and land pollution, including risk assessment, groundwater contamination, global climate change, and sustainable technologies.

CEE 4310. Water Quality Engineering. 3 Credit Hours.
Reclamation of water and wastewater for potable and industrial uses, groundwater remediation. Principles of physical, chemical, and biological treatment processes.

CEE 4320. Hazardous Substance Engineering. 3 Credit Hours.
Technical aspects of hazardous waste management and treatment including legislation, exposure and risk assessment, contaminant fate and transport, waste treatment methods, and remediation technologies.

CEE 4330. Air Pollution Engineering. 3 Credit Hours.
Introduction to the physical and chemical processes affecting the dynamics and fate of air pollutants at the local, regional, and global scales. Particular emphasis is on tropospheric pollutant chemistry and transport.

CEE 4340. Environmental Modeling and Health Risk Analysis. 3 Credit Hours.
This course provides an introduction to modeling techniques used in the environmental health field, with emphasis on three different exposure pathways introduced as the air pathway, groundwater pathway, and surface water pathway.

CEE 4350. Environmental Technology in the Developing World. 3 Credit Hours.
Approaches, methods, and practical aspects of employing technologies for improving environmental quality in low and middle income countries. Team project-based course with field component.

CEE 4360. Energy and Resource Recovery. 3 Credit Hours.
This is an upper level course to introduce the technical aspects of achieving a more sustainable world by energy and resource recovery. Specifically, this course will cover both renewable energy and solid waste management.

CEE 4395. Environmental Systems Design Project. 3 Credit Hours.
Design and assessment of an environmental system, component or process, including problem definition, data acquisition, modeling and analysis, evaluation of alternatives, and presentations.

CEE 4405. Introduction to Geotechnical Engineering. 3 Credit Hours.
Introduction to soil as an engineering material, with a focus on the mechanics of soil strength and compressibility, and fluid flow through soils.

CEE 4406. Applied Geotechnics. 3 Credit Hours.
Geotechnical principles applied to civil engineering construction, including evaluation of soil and rock properties, shallow foundations, drive and bored pilings, liquefaction, and ground modification. Credit not allowed for both CEE 4406 and CEE 4410.

CEE 4420. Subsurface Characterization. 3 Credit Hours.
Introduction to field and laboratory methods for characterizing subsurface geological, hydrological, geotechnical, and contaminant conditions.

CEE 4430. Environmental Geotechnics. 3 Credit Hours.
Chemical equilibria and partitioning in subsurface systems; hazardous waste site assessment technologies and data; including soil gas data, monitoring wells, and direct-push technology.

CEE 4450. Introduction to Petroleum Geomechanics. 3 Credit Hours.
Introduction to the basic concepts of geomechanics and their engineering applications with a focus on the petroleum - and energy - related applications.

CEE 4460. International Disaster Reconnaissance. 3 Credit Hours.
Reviews consequence of and response to foreign disasters in light of technical, cultural and political factors; disasters include earthquakes, floods, hurricanes/typhoons, and man-made infrastructure failures.

CEE 4510. Structural Steel Design. 3 Credit Hours.
Principles of behavior of tension and compression members, beams, and connections with application to the design of elementary structures.

CEE 4520. Reinforced Concrete Design. 3 Credit Hours.
Principles of behavior of reinforced concrete beams, short columns, and slabs, with application to the design of elementary concrete structures, foundation, and earth- retaining structures.

CEE 4530. Timber and Masonry Design. 3 Credit Hours.
Stress-based design of tension, compression, and flexural members; design of building systems, unreinforced and reinforced walls using timber and masonry construction materials and techniques.

CEE 4540. Infrastructure Rehabilitation. 3 Credit Hours.
Rehabilitation of civil infrastructure systems including aspects of deterioration science, nondestructive assessment, renewal engineering, construction planning and management, and public policy and finance.

CEE 4550. Structural Analysis II. 3 Credit Hours.
Analysis of two- and three-dimensional statically indeterminate structures by classical and matrix methods of solution. Flexibility and stiffness techniques, influence lines, approximate analysis, and nonlinear analysis.

CEE 4551. Historic Structures. 3 Credit Hours.
Course examines some of the world's great structures from an engineering and structural art perspective while integrating architecture and history-based concepts.

CEE 4552. Introduction to Finite Element Methods. 3 Credit Hours.
Introduction to Finite Element Methods in Civil Engineering. Formulation of FE numerical methods for solving engineering problems applied to trusses, frames and 2D continuum problems.

CEE 4560. Origami Engineering. 3 Credit Hours.
This class acquaints the student with the state-of-art concepts and algorithms to design and analyze origami structures, assemblages, and tessellations.

CEE 4600. Transportation Planning, Operations, and Design. 3 Credit Hours.
Introduction to transportation engineering with specific emphasis on the planning, design, and operation of transportation facilities.

CEE 4610. Multimodal Transportation Planning, Design, and Operations. 3 Credit Hours.
Planning, design, and operation of systems of air, rail, water, and highway facilities, including those for bicycles and pedestrians.

CEE 4620. Environmental Impact Assessment. 3 Credit Hours.
Key policy, planning, and methodological issues in the environmental impact assessment of engineering systems including the regulatory framework and analytical techniques.

CEE 4640. Freeway and Interchange Planning and Design. 3 Credit Hours.
An introduction to the planning and design of freeways and interchanges. Topics include various interchange forms, HOV lanes, ramp metering, tolling, and truck by-pass ramps.

CEE 4650. Site Development Planning and Design in Transportation. 3 Credit Hours.
An introduction to the planning and design of site developments. Topics include site traffic analysis and driveway, parking lot, drive-thru facility, site circulation, delivery facility and residential neighborhood design.

CEE 4660. Sustainable Transportation Abroad. 3 Credit Hours.
Planning, design, and operations of transportation systems in countries with sustainable multimodal infrastructure; applying lessons learned to US; leadership development in context of sustainable technologies.

CEE 4670. Introduction to Transportation and Public Health. 3 Credit Hours.
Examines the linkage between transportation and human health in both a population and occupational sense. Explores how public and private decision making and the engineering design of transportation systems influences public health.

CEE 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

CEE 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

CEE 4791. Mechanical Behavior of Composites. 3 Credit Hours.
Stress-strain behavior of composites, property of matrix and reinforcing materials, mechanics of fiber-reinforced composites, lamina and laminate analysis, and mechanical performance. Crosslisted with AE, CHE, ME, MSE, and PTFE 4791.

CEE 4793. Composite Materials and Processes. 3 Credit Hours.
Basic principles of selection and design of composite materials and their manufacturing and testing. Cost factors. Laboratory exercises on manufacturing and tests. Crosslisted with AE, CHE, ME, MSE, and PTFE 4793.

CEE 4794. Composite Materials and Manufacturing. 4 Credit Hours.
Basic principles of selection and design of composite materials and their manufacturing and testing. Cost factors. Laboratory exercises on manufacturing and tests. Crosslisted with AE, CHE, ME, MSE, and PTFE 4794.

CEE 4795. Groundwater Hydrology. 3 Credit Hours.
Dynamics of flow and solute transport in groundwater, including theory, implementation, and case studies. Crosslisted with EAS 4795.

CEE 4801. Special Topics. 1 Credit Hour.

CEE 4802. Special Topics. 2 Credit Hours.

CEE 4803. Special Topics. 3 Credit Hours.

CEE 4804. Special Topics. 4 Credit Hours.

CEE 4805. Special Topics. 5 Credit Hours.

CEE 4806. Special Topics. 6 Credit Hours.

CEE 4900. Undergraduate Honors Research Project. 1-21 Credit Hours.
Individual research projects conducted in conjunction with and under the direction of a CEE faculty member. Participation by invitation, and agreement with individual faculty members. Project culminates in a thesis and presentation.

CEE 4901. Special Problems. 1-21 Credit Hours.

CEE 4902. Special Problems. 1-21 Credit Hours.

CEE 4903. Special Problems. 1-21 Credit Hours.

CEE 4XXX. Civil and Environmental Engineering Elective. 1-21 Credit Hours.

CEE 6100. Construction Project Planning. 3 Credit Hours.
Introduction to project planning concepts including organization development, computer-based scheduling, computer-based estimating, regulatory agencies, and project financing.

CEE 6110. Computer Applications in Construction. 3 Credit Hours.
Introduction to computing tools impacting the construction industry and the analysis techniques used to determine company automation requirements.

CEE 6125. Construction Industry Best Practices. 3 Credit Hours.
Front End Planning, Risk Assessment and Dispute Prevention, Constructability, Advanced Work Packaging, Planning for Startup, Change and Material managements, Alignment, Modularization, Quality Control, Zero Accident Techniques.

CEE 6130. Construction Project Controls. 3 Credit Hours.
Introduction to project control concepts and advanced implementation techniques. Project control concerns including project budgeting, project productivity, cash flow, and resource allocation will be introduced.

CEE 6140. Advanced Planning and Estimating Methods. 3 Credit Hours.
Overview of advanced methods for planning and estimating construction projects including resource allocation/management, project control techniques, interpretation of schedules and estimates, and value engineering.

CEE 6150. Construction Law. 3 Credit Hours.
Overview of construction law and legal issues encountered by the construction engineer and manager.

CEE 6160. Safety Engineering. 3 Credit Hours.
Application of pro-active safety engineering approaches including theories of accident causation, human error classification, prevention through design, safety knowledge transfer and safety leading indicators.

CEE 6170. Project Delivery and Procurement. 3 Credit Hours.
Analysis of construction project delivery including traditional, design-build, construction management, multiple prime contractors, and related financing. The course focuses on the owner's role in construction.

CEE 6185. Automation in Construction. 3 Credit Hours.
Introduction to construction automation, robotics, AI, sensing, and 3D visualization. An integrated approach to design and assess new automated construction technologies using needs assessment, AHP, and economic feasibility analyses.

CEE 6190. Construction Field Engineering. 3 Credit Hours.
Introduction to construction engineering techniques and practices including site excavation, shoring structures, heavy equipment, site layout, and temporary facility construction.

CEE 6210. Coastal Mechanics. 3 Credit Hours.
Introduction to physical and mathematical descriptions of the major coastal processes: including linear wave mechanics, nearshore circulation, and ocean tides.

CEE 6215. Coastal Structures. 3 Credit Hours.
Introduction to coastal structures with a focus on the hydrodynamic loading and the resulting analysis, design and potential failure mechanisms during extreme events.

CEE 6221. Physical Hydrology. 3 Credit Hours.
Occurrence, movement, and distribution of water. Topics: hydrologic cycle, global circulation, climate, atmospheric water vapor, thermodynamics, precipitation, evaporation, snowmelt, soil moisture, unsaturated flow, infiltration, geomorphology, runoff, and routing.

CEE 6222. Hydrometeorology. 3 Credit Hours.
Estimation of hydrologic variables from on-site and remote sensors; operational hydrologic models; parameter estimation; operational forecasting.

CEE 6225. Coastal Engineering. 3 Credit Hours.
Introduction to coastal engineering processes and problems. Topics include: water wave mechanics, nearshore hydrodynamics, astronomical tides, sediment transport, beach nourishment, and coastal structures.

CEE 6231. Probability and Statistics for Civil and Environmental. 3 Credit Hours.
Engineers Probability distributions applicable to civil engineering Systems; function of random variables; regression and correlation analysis; parameters estimation and statistical hypothesis tests.

CEE 6232. Stochastic Hydrology. 3 Credit Hours.
Stochastic modeling of hydrologic processes. Problems of model specifications and parameter identification, and validation. Application to forecasting and synthetic events.

CEE 6241. Water Resources Management I. 3 Credit Hours.
Operations research methodologies, including linear and nonlinear programming, and their applications to water resources systems.

CEE 6242. Water Resources Management II. 3 Credit Hours.
Design of decision support systems for water resources planning and management.

CEE 6244. Random Fields and Geostatistics. 3 Credit Hours.
Probability density function; moments; scales of fluctuations; spectral representation; simulation of random fields; cross-correlated random fields; vector fields; kriging; conditional simulation.

CEE 6251. Intermediate Fluid Mechanics. 3 Credit Hours.
Concepts of linear and angular deformation, vorticity, and conservation of mass. Development of Navier-Stokes with solutions: steady and unsteady uniform laminar, vortex, creeping, and potential flow.

CEE 6252. Advanced Fluid Mechanics. 3 Credit Hours.
Theory of three-dimensional turbulent boundary layers with application to environmental flows in rivers, estuaries, and the atmosphere of interest in water resources engineering.

CEE 6261. Environmental Fluid Mechanics. 3 Credit Hours.
Dynamics, mixing, and contaminant transport in surface water bodies, including lakes, rivers, estuaries, and coastal waters. Introduction to numerical models. Prediction of mixing zones.

CEE 6262. Advanced Environmental Fluid Mechanics. 3 Credit Hours.
Buoyancy modifications to the mixing and dynamics of pollutant discharges and surface water bodies. Gathering and analysis of laboratory and field data for mixing problems.

CEE 6271. Flow and Transport through Porous Media I. 3 Credit Hours.
Basic principles governing ground water flow. Topics covered: fundamental principles of saturated and unsaturated ground water flow, contaminant transport, and salt water intrusion.

CEE 6281. Open Channel Hydraulics. 3 Credit Hours.
Flow of liquids with free surfaces in artificial and natural channels. Analysis of flow resistance. Computation of gradually varied flow profiles. Flow through transitions, spillways, bridges, culverts. Analysis of unsteady flow.

CEE 6282. Sediment Transport. 3 Credit Hours.
Engineering importance of erosion and sedimentation problems. Topics: properties of non-cohesive/cohesive sediments including specific weight/gravity/shape/size/ size distribution/fall velocity/mineral structure/ rheological properties.

CEE 6284. Hydraulic Transients in Fluid Systems. 3 Credit Hours.
Transient flow of liquids in piping systems. One-dimensional wave equations and method of characteristics. Effects of valves and pumps on water hammer. Cavitation and liquid-column separation.

CEE 6293. Hydrodynamic Stability and Turbulence. 3 Credit Hours.
Flow in stability and turbulence are important in virtually all environmental flows. Fundamental stability, transition, and turbulent concepts along with their engineering relevance will be introduced.

CEE 6310. Process Principles in Environmental Engineering. 3 Credit Hours.
Principles that can be used in the analysis and modeling of environmental engineering processes, including material and energy balances, mass transfer, and reaction engineering.

CEE 6311. Microbial Principles in Environmental Engineering. 3 Credit Hours.
Microbiological principles with emphasis on microbial nutrition and growth, inhibition and control of growth, biochemical thermodynamics, metabolic pathways, enzyme and microbial kinetics.

CEE 6312. Chemical Principles in Environmental Engineering. 3 Credit Hours.
Fundamental principles of chemical equilibria and environmental organic chemistry in dilute aqueous systems with emphasis on chemical speciation and environmental engineering applications.

CEE 6313. Fate of Contaminants in the Subsurface. 3 Credit Hours.
Effects of physical, chemical, and biological processes on the fate and transport of contaminants in unsaturated and saturated porous media.

CEE 6314. Fundamentals of Environmental Modeling and Mathematics. 3 Credit Hours.
This course is designed to provide an understanding of fundamental principles and approaches used in modeling environmental systems, as well as the necessary mathematical techniques.

CEE 6315. Environmental Nanotechnology. 3 Credit Hours.
The course is divided into two primary sections: 1) fundamentals of nanomaterials and nanotechnology and 2) the environmental applications of nanotechnology.

CEE 6319. Environmental Sciences and Engineering Laboratory. 3 Credit Hours.
Laboratory exercises and discussions for the understanding of fundamental chemical analytical, physicochemical, and applied microbiological principles in environmental engineering.

CEE 6320. Legal, Institutional, and Policy Frameworks for Water Resources Planning and Management. 3 Credit Hours.
Fundamental principles of national and international water policy, legislation and management frameworks for transboundary water resources management.

CEE 6321. Water Quality and Ecology in Lakes and Rivers. 3 Credit Hours.
Mixing/transport of pollutants and natural substances in surface waters, lakes, rivers, estuaries, coastal waters. Application of mathematical models of hydrodynamics and water quality to these water bodies.

CEE 6322. Water Resources Systems Analysis. 3 Credit Hours.
The policy, legal, and institutional contexts of water resources planning and management, information and modeling systems, modeling tools, and the practical experience with the use of decision support systems.

CEE 6323. Natural Resources and Environmental Economics. 3 Credit Hours.
Relation between economic and ecological systems, case studies and examples, tools of environmental policy, environmental economic evaluation.

CEE 6324. Water Supply and Sanitation. 3 Credit Hours.
Sanitation, wastewater characterization, wastewater treatment process analysis and selection, pre-treatment options, biological treatment, removal of pollutants biosolids treatment and disposal, and safe water systems.

CEE 6325. River Hydraulics. 3 Credit Hours.
Open channel hydraulics, fluvial geomorphology, flood control structures, culverts, bridge openings, river bed and bank stability control measures.

CEE 6326. Hydrologic Principles aned Practices. 3 Credit Hours.
Hydrologic cycle, global circulation, climate, atmospheric water vapor, thermodynamics, precipitation, evaporation, snowmelt, soil moisture, unsaturated flow, infiltration, geomorphology, runoff, and routing.

CEE 6327. Statistical Methods for Environmental Data Analysis and Prediction. 3 Credit Hours.
Provide a good understanding of the fundamental principles of probability/statistics, and demonstrate the application of these principles to environmental data analysis and prediction problems.

CEE 6330. Physicochemical Processes. 3 Credit Hours.
Theory and application of the physical and chemical processes of coagulation, flocculation, sedimentation, softening, filtration, and disinfection in water and wastewater treatment.

CEE 6331. Biological Processes. 3 Credit Hours.
Microbial growth kinetics and bioenergetics, theory, modeling, and application of biological processes employed in water, wastewater, and hazardous waste treatment systems as well as subsurface bioremediation.

CEE 6332. Separation Processes. 3 Credit Hours.
Theory and applications of the physical and chemical processes of sorption, membrane separation, and absorption in both gas-phase and liquid-phase environmental engineering systems.

CEE 6333. Hazardous Waste Site Remediation. 3 Credit Hours.
Selection, design and implementation of hazardous waste site remediation technologies including pump-and-treat, soil vapor extraction, thermal processes, bioremediation, surfactant flushing, and barrier-treatment walls.

CEE 6341. Industrial Waste Treatment and Disposal. 3 Credit Hours.
A review of current policies and approaches in industrial waste treatment, and application of engineering principles and processes for waste treatment, recovery, and disposal.

CEE 6342. Solid Waste Technology. 3 Credit Hours.
An introduction of the current regulations and fundamentals of solid waste management, characterization, handling, recycling, transportation, and final disposal systems.

CEE 6343. Membrane Processes. 3 Credit Hours.
An introduction of the theories of membrane separation processes with special emphasis on desalination, softening, THM precursors reduction using reverse osmosis and nanofiltration.

CEE 6345. Sustainable Engineering. 3 Credit Hours.
The course is intended to introduce students to the interaction between human and natural environment and provide an overview on the emerging science of sustainability.

CEE 6350. Advanced Environmental Chemistry. 3 Credit Hours.
Chemical behavior of inorganic and organic compounds in natural waters. Topics include chemistry of metal ions, partitioning and distribution of organic pollutants, surface reactions.

CEE 6351. Biotransformation of Xenobiotic Compounds. 3 Credit Hours.
Biotransformation pathways and kinetics of anthropogenic recalcitrant compounds and biological, biochemical, and environmental factors affecting these transformations in natural and engineered systems.

CEE 6355. Industrial Ecology in Environmental Engineering. 3 Credit Hours.
Introduces the principles of environmentally conscious products, processes, and manufacturing systems.

CEE 6360. Design of Treatment Facilities for Drinking Water. 3 Credit Hours.
Theory and design of process tanks and equipment for capture, purification, conditioning, storage, and distribution of safe drinking water.

CEE 6361. Modeling and Simulation of Biological Treatment Systems. 3 Credit Hours.
Theory and design of biological treatment systems for water reclamation, nutrient removal, and integrated process design and optimization using advanced computer models.

CEE 6390. Air Pollutant Formation and Control. 3 Credit Hours.
Analysis of air pollutants through the study of radical reaction pathways, combustion processes, and removal of particles and gaseous pollutants from exhaust gas streams.

CEE 6402. Soil Mechanics. 3 Credit Hours.
Fundamental concepts related to the mechanical behavior of soils, including: effective stress, strength, stiffness, permeability, time-dependent behavior.

CEE 6421. Laboratory Characterization of Geomaterials. 3 Credit Hours.
Instruction in the procedures, methods of interpretation and apparatus limitations and influences for geotechnical laboratory index, strength, deformation, and permeability tests.

CEE 6422. Experimental Methods in Research. 3 Credit Hours.
Topics in experimental research include: scale effects, similarity, falsification, errors, transducers, design of experiments.

CEE 6423. In-Situ Testing and Site Characterization of Geomaterials. 3 Credit Hours.
Field testing and sampling of geomaterials, primarily soils and rocks. Introduces methods of drilling, probing, and in-situ measurement of soils for determining stratigraphy and engineering parameters for analysis, including soil borings, cone penetration tests, pressuremeter, dilatometer, and other tests.

CEE 6424. Engineering Geophysics. 3 Credit Hours.
Geophysical techniques used to characterize near-surface soils and rocks including seismic, magnetic, electromagnetic, radar, and resistivity methods.

CEE 6431. Plasticity of Geomaterials. 3 Credit Hours.

CEE 6432. Finite Element Method for Coupled Processes In Elastic Porous Media. 3 Credit Hours.
Poroelasticity, variational methods, space and time discretization. FEM for solid mechanics, heat/mass transfer and coupled stress/pressure/temperature variations in porous media, e.g. soils, rocks,concrete, bones.

CEE 6441. Analysis of Earth Structures. 3 Credit Hours.
Instruction in techniques for assessing the stability of earth-retaining structures including unreinforced slopes, reinforced slopes, free-standing retaining structures, and reinforced retaining structures.

CEE 6442. Dynamic Analysis in Geotechnical Engineering. 3 Credit Hours.
Dynamic soil properties; response of foundations to dynamic loads; construction and blast vibration criteria; dynamic analysis of pile driving; introduction to liquefaction potential.

CEE 6443. Foundation Systems. 3 Credit Hours.
Evaluation and design of foundations for civil engineering structures, including the settlement and bearing capacity of shallow spread footings, mats, and deep foundations. Footings, driven piles, bored piles, and drilled shafts analyzed using elastic continuum theory, limit plasticity, and cavity expansion solutions, supplemented with numerous case studies. Ancillary topics include axial load transfer, pile group interaction, lateral and moment loading, and pile dynamics.

CEE 6444. Geosynthetics in Civil Engineering. 3 Credit Hours.
Development, fabrication, design, and applications of geotextiles, geogrids, geonets, and geomembranes.

CEE 6445. Geotechnical Earthquake Engineering. 3 Credit Hours.
Earthquake magnitude and intensity, seismic hazard evaluation using deterministic and probabilistic approaches, site response analyses and ground motion amplification liquefaction, and response of earth structures.

CEE 6447. Ground Modification. 3 Credit Hours.
Methods for improving marginal construction sites for geotechnical engineering projects and rehabilitation of geoinfrastructure.

CEE 6448. Landfill Design and Management. 3 Credit Hours.
The course deals with geomaterial selection and characterization, chemical compatibility, placement procedures (including compaction), design strategies, seepage issues, instrumentation, and environmental monitoring.

CEE 6449. Design of Remediation Systems. 3 Credit Hours.
Design of remediation systems and management approaches for the petrochemical, power generation, metals finishing, and mining industries are emphasized. Risk analysis and case histories are presented.

CEE 6451. Rock Mechanics. 3 Credit Hours.
Rock characterization, scale effect, in-situ stresses, mechanisms of rock deformation and fracture, rock engineering; special attention to common principles unifying presented set of topics.

CEE 6460. Theoretical Geomechanics. 3 Credit Hours.
Field equations of linear elasticity, solutions of boundary value problems, steady/transient flow in porous media. Yielding and failure of soils; plasticity theory and limit analyses. Constitutive soil models. Introduction to finite elements with geotechnical engineering applications.

CEE 6461. Mathematical Applications for Civil and Environmental. 3 Credit Hours.
Mathematical techniques are reviewed in the context of CEE problems. The simplified yet mathematically rigorous approach highlights the internal mathematical connections between different engineering problems.

CEE 6462. Signals and Inverse Problems in Civil Engineering. 3 Credit Hours.
Civil engineering signals and systems. Discrete time and frequency domain operations. Nonlinear and nonstationary systems. Inverse problems. Matrix-based and other solutions. Tomography. Civil engineering examples.

CEE 6463. Constitutive Modeling of Soils. 3 Credit Hours.
Fundamental concepts in modeling behavior of soils. Implementation of models into numerical solution codes. Evaluation of models used in practice.

CEE 6481. Unsaturated Soil Mechanics. 3 Credit Hours.
This course presents many of the fundamental concepts behind the mechanical behavior of unsaturated soils.

CEE 6483. Geotechnical Image and Spatial Analysis. 3 Credit Hours.
Presentation of techniques for spatial and image processing and analysis of subsurface data at micro and macro scales.

CEE 6484. Industrial Byproduct Reutilization. 3 Credit Hours.
Explores more fully the interface between geotechnology, geochemistry, and sustainable engineering to develop new applications using industrial byproducts.

CEE 6501. Matrix Structural Analysis. 3 Credit Hours.
Static analysis of framed structures by flexibility and stiffness methods; computer models and solution for applied loads, temperature, support settlement, and member prestrain effects.

CEE 6504. Finite Element Method of Structural Analysis. 3 Credit Hours.
Introduction to the element method with emphasis on analysis of solids and structures. One-, two-, and three-dimensional finite. Modeling, approximations, and errors.

CEE 6507. Nonlinear Finite Element Analysis. 3 Credit Hours.
Lagrangian formulations for nonlinear analysis of solids and structures, including consistent linearization and state determination. Incremental-iterative solution approaches; computational plasticity. Software implementation.

CEE 6509. Structural Dynamics. 3 Credit Hours.
Vibration and dynamic response of structures to periodic and general time-dependent loads, with and without damping effects. Both SDOF and MDOF structural systems are discussed.

CEE 6510. Structural Dynamics. 4 Credit Hours.
Vibration and dynamic response of linear and nonlinear structures to periodic and general disturbing forces, with and without damping effects. Wind and earthquake SDOF and MDOF effects.

CEE 6511. Random Vibration. 3 Credit Hours.
Stochastic processes as tools for modeling time-dependent structural excitations; random dynamic response of structural systems to time-dependent forces; reliability of dynamic structural systems.

CEE 6512. Advanced Dynamics and Smart Structures. 3 Credit Hours.
Overview of advanced dynamics and smart structures. Topics include vibration modal analysis, signal processing, modern sensors technologies, structural monitoring, and structural control.

CEE 6513. Computational Methods in Mechanics. 3 Credit Hours.
Generalization of finite element concepts; Galerkin-weighted residual and variational approaches; mixed and hybrid finite element formulations, applications, transient dynamic analysis; software implementation.

CEE 6521. Reinforced Concrete Members. 3 Credit Hours.
Behavior and design of RC members; ductility and inelastic response; deep beams; corbel and torsion design; column biaxial bending; shearwalls; effects of creep and shrinkage.

CEE 6522. Reinforced Concrete Slab Systems. 3 Credit Hours.
Analysis and design of two-way slab systems, structural walls, and complex building configurations. Equivalent frame and analysis, strip and yield-line technique, application of finite element method to design of slab and wall systems.

CEE 6523. Prestressed Concrete. 3 Credit Hours.
Principles and practice of prestressed concrete. Analysis and design of statically determinate and indeterminate beams, and one-way and two-way slabs; precast pretensioned, posttensioned.

CEE 6527. Advanced Structural Steel Design. 3 Credit Hours.
Strength, behavior, and design of steel structures according to WSD and LRFD. Plate girders, composite beams, bolted and welded connections, beam-columns, and torsion.

CEE 6528. Introduction to Bridge Engineering. 3 Credit Hours.
Introduction to loads, methods of analysis, design, fabrication and construction of girder bridges.

CEE 6530. Structural Systems. 3 Credit Hours.
Behavior and design of steel and concrete building and bridge systems. Introduction to structural planning with emphasis on economics, structural behavior, serviceability, and strength considerations.

CEE 6533. Design of Polymer Composite Structures. 3 Credit Hours.
Strength, behavior, and design of polymeric composites, structural members, and connections for civil engineering applications.

CEE 6536. Rehabilitation of Existing Structures. 3 Credit Hours.
Deterioration science; corrosion of steel, alkali-silica reaction, freezing and thawing. Assessment and evaluation of existing structures, nondestructive testing, and nondestructive evaluation.

CEE 6538. Introduction to Non-Destructive Testing and Forensic Evaluation in Structures.. 3 Credit Hours.
Introduction to the theoretical basis and practical application of nondestructive testing with complementary analytical and destructive testing for the forensic investigation of engineering materials and structures.

CEE 6540. Engineering Risk Analysis. 3 Credit Hours.
Fundamental concepts of probability theory, risk analysis, and decision theory with applications to engineering systems; Bayesian methods; uncertainty analysis; risk-informed decision making .

CEE 6541. Earthquake Engineering. 3 Credit Hours.
Characteristics of earthquakes; design and rehabilitation of civil engineering structures for earthquake ground motion; code provisions; case studies.

CEE 6542. Consequence-Based Earthquake Engineering. 3 Credit Hours.
This course will provide focused instruction on earthquake engineering within a Consequence Based Engineering (CBE) framework. The course will reflect the cross-disciplinary nature of earthquake engineering practice and research, and will provide an overview on diverse topics in hazard definition, vulnerability assessment, mitigation measures and societal impact.

CEE 6544. Structural Modeling. 3 Credit Hours.
Modeling of structures for static, dynamic, and nonlinear analysis using finite elements. Effects of parameters on the structural behavior.

CEE 6548. Inelastic Design. 3 Credit Hours.
Application of fundamental theorems of plastic design to beam, frame, and plate structures. Design based on ultimate strength, ductility and capacity design principles.

CEE 6549. Structural Reliability. 3 Credit Hours.
Concepts and applications of probability and statistics for analysis of risk and reliability of structures subjected to natural and man-made hazards; stochastic load and strength modeling; probabilistic risk assessment; introduction to stochastic computational mechanics.

CEE 6551. Advanced Strength of Materials. 3 Credit Hours.
Study of advanced topics from mechanics of materials with application to structures. Typical topics: energy methods, failure theories, post-yield behavior, generalized bending and torsion.

CEE 6554. Theory of Elastic Stability. 3 Credit Hours.
Concepts of elastic stability, simple mechanical models, buckling of beam-columns and frames, beams on elastic foundation, and plates energy methods, torsional and lateral buckling.

CEE 6557. Theory of Plates and Shells. 3 Credit Hours.
Plate bending, approximate methods, nonlinearity, stiffened and anisotropic plates. Stress and deformation of shells with and without bending, surfaces of revolutions, and shallow shells.

CEE 6560. Applied Elasticity. 3 Credit Hours.
Introduction to traction, stress, and equilibrium; deformations, strain compatibility; constitutive equations; two-dimensional problems in Cartesian and polar coordinates; application to extension, bending, and torsion.

CEE 6563. Energy Methods in Mechanics. 3 Credit Hours.
Virtual work, principles of potential energy and complementary energy, Castigliano's theorems, generalized and stationary variational principles, energy methods, structural applications, nonlinear problems, Hamilton's principle.

CEE 6566. Plasticity and Viscoelasticity. 3 Credit Hours.
Plastic deformation, yield conditions, flow rules and normality, relaxation and creep, viscoelasticity, tubes and spheres, torsion and bending, slip line fields, viscoelastic boundary value problems.

CEE 6569. Wave Propagation in Solids. 3 Credit Hours.
Plane waves in elastic half-spaces, reflection and refraction; Rayleigh and Stonely waves; waveguides, Love waves, Rayleigh-Lamb modes; Cagniard-de Hoop method; in anisotropic media.

CEE 6571. Experimental Stress Analysis. 3 Credit Hours.
Study of surface stress and strain using brittle coatings and strain gauges. Strain gauge circuits, static and dynamic problems, transducer design and circuits.

CEE 6585. Materials Science of Concrete. 3 Credit Hours.
This course integrates fundamental science-based concepts with engineering-based design of concrete toward the development of a more complete understanding of the relationships between materials design and multi-scale behavior.

CEE 6590. Durability of Cement-based Materials. 3 Credit Hours.
Develop fundamental understanding of the chemical, physical, and mechanical aspects surrounding the durability of cement-based materials.

CEE 6601. Linear Statistical Models in Transportation. 4 Credit Hours.
Theory of simple and multivariate regression and analysis of variance models. Assessment of modeling assumptions and remedial measures. Applications in the field of transportation planning.

CEE 6602. Urban Transportation Planning. 4 Credit Hours.
An overview course on the history, finance, operations, modeling, politics, environmental impacts, and planning of urban transportation systems in the United States.

CEE 6603. Traffic Engineering. 3 Credit Hours.
Characteristics of traffic demand, traffic flow, vehicles, drivers, roadways, and pedestrians. Studies and data analysis. Capacity analysis. Traffic control and intelligent systems. Operations and management.

CEE 6605. Transportation Administration and Policy Analysis. 3 Credit Hours.
Overview of institutions and policy processes in the transportation sector: organizational analysis and implementation; policy analysis.

CEE 6621. GIS in Transportation. 3 Credit Hours.
Theory and application of GIS applied to transportation engineering and planning (GIS-T). Laboratory focuses on GIS-T development.

CEE 6622. Travel Demand Analysis. 3 Credit Hours.
Examination of methods for forecasting future site and regional-level travel demand. Model specification, calibration, and validation.

CEE 6623. Survey Design and Analysis. 3 Credit Hours.
Design of telephone, mail out, and personal interview survey instruments. Subsequent estimation of choice-based models from cross-sectional and panel survey data.

CEE 6624. Land Use - Transportation Interaction. 3 Credit Hours.
Overview of land use and transportation planning principles, how development impacts air transportation, how transportation investments impact development patterns and air quality.

CEE 6625. Transportation, Energy, and Air Quality. 3 Credit Hours.
Students investigate relationships between transportation demand, energy supply and consumption, fuel types, greenhouse gas emissions, and relationships between vehicle technology, pollutant emissions, modeling techniques, and air quality.

CEE 6631. Signalized Intersections and Networks. 3 Credit Hours.
Traffic-responsive signalization. Detector placement and signal timing at individual intersections. Hands-on practice with equipment. Timing of coordinated systems. Signal plans and specifications.

CEE 6632. Simulation Models in Transportation. 3 Credit Hours.
Simulation models in transportation: development, calibration, applications, and analysis of outputs.

CEE 6633. Advanced Traffic Detection and Control. 3 Credit Hours.
Latest developments in traffic control equipment and software, including incident management. Communications- technology alternatives. Video, other above-road detector technologies. Hands-on practice with equipment.

CEE 6634. Transportation Safety Analysis. 3 Credit Hours.
Understanding the human factors elements of transportation safety, and how to appropriately model the highly complex and stochastic occurrence of accidents on a transportation network.

CEE 6635. Technology Innovation in Transportation. 3 Credit Hours.
Technology innovations in transportation including Intelligent Transportation Systems. Planning and design of ITS systems.

CEE 6636. Traffic Flow Theory. 3 Credit Hours.
Advanced study of underlying principles and analytical procedures used in performing capacity analyses of transportation facilities. Highway Capacity Manual procedures and other analytical techniques presented.

CEE 6641. Transportation Infrastructure Management and Traffic Control. 3 Credit Hours.
Transportation infrastructure traffic control and safety- related issues are addressed for initial implementation of transportation facilities as well as daily operational aspects.

CEE 6642. Transit Systems Planning and Design. 3 Credit Hours.
Introduction to transit system planning and design concepts. Course will discuss the planning, design, and operations of transit systems, and the operations of intermodal terminals.

CEE 6650. Discrete Choice Modeling. 3 Credit Hours.
Theory and application of probabilistic models of selection among discrete alternatives, including multinomial and nested logit and probit. Population heterogeneity. Sampling and aggregation issues.

CEE 6651. Infrastructure Systems Management. 3 Credit Hours.
Analytical approaches and tools for infrastructure and asset management, sustainable systems development.

CEE 6652. Infrastructure Management: IT Applications. 3 Credit Hours.
Introduction to information technologies (programming, database, GPS/GIS, etc.) and their applications to the life-cycle activities (e.g. design, construction, etc.) of CEE engineered systems.

CEE 6701. Urban Transportation Planning. 3 Credit Hours.
An overview course on the history, finance, operations, modeling, politics, environmental impacts, and planning of urban transportation systems in the United States.

CEE 6702. Urban Transportation Planning Laboratory. 1 Credit Hour.
Transportation planning/engineering laboratory and field experience.

CEE 6720. Environmental Microbial Genomics. 3 Credit Hours.
To introduce advanced concepts and principles of contemporary environmental microbiological research and associated bioinformatics techniques through representative examples from recent literature.

CEE 6751. Physical Properties and Rheology of Rocks. 3 Credit Hours.
Structure, properties, and rheology of minerals and rocks with applications to engineering structures and natural phenomena in the Earth. Fundamentals of rock mechanics and crack propagation. Crosslisted with EAS 6751.

CEE 6754. Engineering Communication. 3 Credit Hours.
Writing and editing engineering documents; designing and explaining visuals; creating and delivering electronic presentations. Crosslisted with MSE 6754.

CEE 6756. Discovery of Signaling Molecules. 3 Credit Hours.
The diversity of chemical signals between organisms and their structural specificities will be presented along with chemical and biological methods for isolating signaling molecules. Crosslisted with BIOL 6756 and CHEM 6756.

CEE 6790. Air Pollution Physics and Chemistry. 3 Credit Hours.
Introduction to physical and chemical processes affecting dynamics and fate of air pollutants at local, regional, and global scales; emphasis on tropospheric pollutant chemistry and transport. Crosslisted with EAS 6790.

CEE 6792. Air Pollution Meteorology and Chemistry. 3 Credit Hours.
Vertical temperature and wind structure, topographic effects, natural removal processes, atmospheric dispersion of stack effluents, air pollution climatology, meteorological management of air pollution. Crosslisted with EAS 6792.

CEE 6794. Atmospheric Chemical Modeling. 3 Credit Hours.
Application of modern numerical methods to the prediction of atmospheric chemical and physical compositions; specific applications using computer models developed by the students are included. Crosslisted with EAS 6794.

CEE 6795. Atmospheric Aerosols. 3 Credit Hours.
Chemical and physical properties of natural and anthropogenic aerosols. Sources, transport, transformation, and fate of primary/secondary, organic/inorganic, atmospheric semi-volatiles and aerosols. Crosslisted with EAS 6795.

CEE 6810. Linear Ocean Surface Wave Mechanics. 3 Credit Hours.
Introduction to linear wave mechanics with emphasis on boundary value problems. Topics include wavemakers, boundary layers, wave/current interactions, long waves, edge waves and wave forces.

CEE 6811. Nonlinear Ocean Surface Wave Mechanics. 3 Credit Hours.
Advanced solutions of nonlinear wave equations including introduction to perturbation methods, shallow and deep water solutions, nonlinear wave interactions and stream function solutions.

CEE 6821. Nearshore Hydrodynamics. 3 Credit Hours.
Introduction to surfzone hydrodynamics including properties of breaking waves, undertow, longshore currents, wave setup, rip currents, infragravity waves, shear waves, and combined wave/current boundary layers.

CEE 6840. Coastal Sediment Transport. 3 Credit Hours.
Transport of cohesive and non-cohesive sediments in tidal and surf zone environments, measurement of sediment transport, numerical modeling of sediment transport and beach evolution.

CEE 6842. Coastal Engineering Measurements. 3 Credit Hours.
Measurement of scalars (temperature, concentration), and vectors (velocity, waves), with emphasis on water and sediments. Acoustical and optical sensors. Quantitative use of digital video/photographic data.

CEE 6XXX. Civil and Environmental Engineering Elective. 1-21 Credit Hours.

CEE 7000. Master's Thesis. 1-21 Credit Hours.

CEE 7751. Computational Fluid Mechanics. 3 Credit Hours.
Numerical methods for solving the time-dependent Navier-Stokes equations in complex geometrics, including theory, implementation, and applications. Crosslisted with ME 7751.

CEE 7772. Fundamentals of Fracture Mechanics. 3 Credit Hours.
Advanced study of failure of structural materials under load, mechanics of fracture, and microscopic and macroscopic aspects of the fracture of engineering materials. Crosslisted with AE, CHE, ME, and MSE 7772.

CEE 7774. Fatigue of Materials and Structures. 3 Credit Hours.
Mechanical and microstructural aspects of nucleation and growth of cracks under cyclic loading conditions, nitch effects, cumulative damage, multiaxial loading, and fatigue crack propagation. Crosslisted with AE, CHE, ME, and MSE 7774.

CEE 7791. Damage, Failure and Durability of Composite Materials. 3 Credit Hours.
Provide knowledge of the fundamental concepts and methods related to analysis and assessment of damage, failure and durability of composite materials. Crosslisted with AE, CHE, ME, MSE, and PTFE 7791.

CEE 7792. Advanced Mechanics of Composites. 3 Credit Hours.
Anisotropic elasticity, failure theories, hygrothermal behavior, 3-D analysis of laminates, thick laminates, free edge effects, stress concentrations, joints, creep and fracture of composites. Crosslisted with AE, CHE, ME, MSE and PTFE 7792.

CEE 7793. Manufacturing of Composites. 3 Credit Hours.
Major manufacturing techniques for metal-, ceramic-, and polymer-matrix composites. Modeling of processes with emphasis on fundamental mechanisms and effects. Crosslisted with AE, CHE, ME, MSE and PTFE 7793.

CEE 8090. Geosystems Engineering Seminar. 1 Credit Hour.
Presentation and discussion of current research and practice developments in geosystems engineering by invited speakers, including practitioners and faculty.

CEE 8091. Construction Seminar. 1 Credit Hour.
Introduction to leading-edge industry practices not part of the regular curriculum using field trips and guest lectures.

CEE 8094. Environmental Engineering Seminar. 1 Credit Hour.
Developments in environmental engineering science and technology, current practice, current research, and special topics related to environmental quality assessment and control.

CEE 8095. Research Seminar in Environmental Engineering. 1 Credit Hour.
Discussion of current research topics in environmental engineering. Presentations by master's and doctoral students.

CEE 8096. Environmental Fluid Mechanics & Water Resources Seminar. 1 Credit Hour.
Presentation and discussion of current research developments in environmental fluid mechanics and water resources by outside speakers, faculty, and graduate students.

CEE 8097. Introduction to Transportation Research. 1 Credit Hour.
The planning, organization and execution of professional transportation research. Topics include: human factors, safety, ethics, technical communications and the peer review process. Fulfills RCR requirements.

CEE 8099. Seminars in Structural Engineering, Mechanics and Materials for PhD students.. 1 Credit Hour.
Seminars for CEE PhD students in Structural Engineering, Mechanics and Materials (SEMM) to improve and practice technical communication skills.

CEE 8811. Special Topics. 1 Credit Hour.
Topics of current interest in civil engineering.

CEE 8812. Special Topics. 2 Credit Hours.
Topics of current interest in civil engineering.

CEE 8813. Special Topics. 3 Credit Hours.
Topics of current interest in civil engineering.

CEE 8814. Special Topics. 4 Credit Hours.
Topics of current interest in civil engineering.

CEE 8815. Special Topics. 5 Credit Hours.
Topics of current interest in civil engineering.

CEE 8823. Special Topics. 3 Credit Hours.
Special Topics for CEE (lecture and supervised lab).

CEE 8824. Special Topics. 4 Credit Hours.
Topics of current interest in civil engineering.

CEE 8831. Special Topics. 1 Credit Hour.

CEE 8900. Special Problems. 1-21 Credit Hours.

CEE 8901. Special Problems. 1-21 Credit Hours.

CEE 8902. Special Problems. 1-21 Credit Hours.

CEE 8903. Special Problems. 1-21 Credit Hours.

CEE 8950. Master's Special Research Project. 1-21 Credit Hours.
Master's research project to be scheduled by M.S. students not writing thesis.

CEE 8956. Master's Special Research Problem. 1-21 Credit Hours.
For nonthesis students performing research.

CEE 8997. Teaching Assistantship. 1-9 Credit Hours.
For students holding graduate teaching assistantships.

CEE 8998. Research Assistantship. 1-9 Credit Hours.
For students holding a graduate research assistantship.

CEE 8999. Preparation for Doctoral Dissertation. 1-21 Credit Hours.
For students in the preliminary stages of formulating their doctoral research program who have not obtained formal approval of dissertation topic.

CEE 9000. Doctoral Thesis. 1-21 Credit Hours.

Center Enhancement-Teach/Learn (CETL)

CETL 2000. Undergraduate Teaching Assistant Preparation. 1 Credit Hour.
This course is an introduction to the procedural information and practical skills needed to be an effective undergraduate teaching assistant. May be used as free elective credit with department approval.

CETL 2001. Fundamentals of Peer Tutoring. 1 Credit Hour.
This course is an introduction to the practical skills needed to be an effective peer tutor at Georgia Tech. May not be used towards degree requirements.

CETL 2002. Fundamentals of K-12 Tutoring. 1 Credit Hour.
This course is an introduction to the practical skills needed to be an effective tutor in the K-12 arena. May not be used towards degree requirements.

CETL 2698. Research Assistantship. 1-12 Credit Hours.
Credit hours to be arranged. Independent research conducted under the guidance of a faculty member. May not be used towards degree requirements.

CETL 2699. Undergraduate Research. 1-12 Credit Hours.
Credit hours to be arranged. Independent research conducted under the guidance of a faculty member. May be used as free elective towards BS degrees with department approval.

CETL 3000. Residence Life Seminar. 1 Credit Hour.
This course will provide students with techniques, skills and knowledge necessary to become a successful Residence Life Student Staff member. May not be used towards degree requirements.

CETL 3801. Special Topics. 1 Credit Hour.
Topics of current interest. May not be used towards degree requirements.

CETL 4001. Principles of Learning and Teaching I. 3 Credit Hours.
This course focuses on the knowledge and skills necessary for effective classroom instruction and management including: educational psychology, instructional design and delivery techniques. May be used as free elective towards BS degrees with department approval.

CETL 4002. Principles of Teaching and Learning II. 3 Credit Hours.
This course focuses on the knowledge and skills necessary for effective classroom instruction and management including instructional planning, assessment, and the teaching professional community. May be used as free elective towards BS degrees with department approval.

CETL 4698. Research Assistantship. 1-12 Credit Hours.
Credit hours to be arranged. Independent research conducted under the guidance of a faculty member. May not be used towards degree requirements.

CETL 4699. Undergraduate Research. 1-12 Credit Hours.
May be used as free elective towards BS degrees with department approval.

CETL 4801. Special Topics. 1 Credit Hour.
Topics of Current Interest. May not be used towards degree requirements. May not be used towards degree requirements.

CETL 4802. Special Topics. 2 Credit Hours.
Topics of Current Interest. May not be used towards degree requirements.

CETL 4803. Special Topics. 3 Credit Hours.
Topics of Current Interest. May not be used towards degree requirements.

CETL 6490. Advanced Environmental Data Analysis. 3 Credit Hours.
A unified view of the theories and applications underlying the statistical analysis of environmental data in the space, time and spectral domain.

CETL 8000. Graduate Teaching Assistant Preparation. 1 Credit Hour.
This course is an introduction to the procedural information and practical skills needed to be an effective graduate teaching assistant.

CETL 8701. Classroom Management and Policies: Effective Teaching. 1 Credit Hour.
A course in which students learn about official Georgia Tech policies impacting instruction and develop skills to resolve problems and enhance classroom learning.

CETL 8711. Student and Teacher Enhancement Partnership Summer Training. 1-21 Credit Hours.
Participants attend training sessions on pedagogy, classroom management, educational technology; engage in practice teaching; and design action plans for partnering with local high school teachers.

CETL 8712. STEP Fellows Academic Year Seminar. 1 Credit Hour.
This is the academic year follow-up course for STEP fellows. It is a forum to share and to continue training as the fellows work in their STEP high schools.

CETL 8713. Teaching and Learning in Higher Education. 3 Credit Hours.
This course explores how to apply evidence-based teaching practices in higher education including principles of learning, student development, inclusive teaching, and instructional strategies..

CETL 8714. Teach Practicum-HigherEd. 2 Credit Hours.
Apprentice to faculty mentor and help teach a college course. Get feedback from mentor, CETL, and a peer learning community. Explore types of academic careers.

CETL 8715. Teach Practicum-HigherEd. 3 Credit Hours.
Apprentice to faculty mentor and help teach a college course. Get feedback from mentor, CETL, and a peer learning community. Explore types of academic careers.

CETL 8717. Course Design for Higher Education. 3 Credit Hours.
This course examines evidence-based teaching, formative and summative assessment, and educational technology as students apply the backward design process in developing a college course.

CETL 8718. Teaching Capstone in Higher Education. 3 Credit Hours.
Students apply evidence-based teaching and backward design principles, student assessment, peer and mentor feedback through supervised college teaching in this Tech to Teaching certificate capstone.

CETL 8719. Teaching Immersion-Higher Education. 1 Credit Hour.

CETL 8721. Academic Writing for Graduate Students and. 1 Credit Hour.
Through examination of writing samples and practice, students learn techniques for enhancing proposal preparation and methods for evaluating writing as future instructors and thesis directors.

CETL 8722. Academic Writing for International Graduate Students. 1 Credit Hour.
This course aids international graduate students in enhancing their academic writing skills in English through exposure to, and practice of producing examples of academic writing. Credit will not be awarded for both CETL 8722 and CETL 8723.

CETL 8723. Academic Writing for International Graduate Students. 2 Credit Hours.
This course helps international graduate students enhance their academic writing skills in English through analysis and production of academic writing samples. Credit not awarded for both CETL 8723 and CETL 8722.

CETL 8731. Academic Professionalism. 1 Credit Hour.
Participants in this course work through numerous exercises and scenarios in order to prepare them professionally and personally for a future career in academics.

CETL 8741. Academic Presentations. 1 Credit Hour.
An examination and practice of oral presentations in a variety of academic scenarios: e.g., conference talks, proposal presentations, discussion facilitation, job talks, and oral exams/defenses.

CETL 8791. Instructional Practices for International. 2 Credit Hours.
Enhancement of English pronunciation and instructional skills for international teaching assistants. In-class and small-group language practice; discussion of teaching methodology.

CETL 8792. Classroom English and Pedagogy for International. 2 Credit Hours.
Enhancement of English pronunciation and instructional skills for international teaching assistants. In-class and small-group language practice; discussion of teaching methodology; individual tutoring.

CETL 8793. Oral Skills for International Graduate Students. 2 Credit Hours.
An oral skills class designed to help graduate students become more accurate and fluent in both verbal and nonverbal skills. In addition to working on acquiring an American accent and body language when speaking English, students will work on basic presentation skills. Credit will not be awarded for CETL 8793 and CETL 8797.

CETL 8794. Academic English for International Graduate Students. 1 Credit Hour.
Enhancement of English pronunciation for international teaching assistants. In-class and small group language practice.

CETL 8795. Advanced Oral Skills for International Graduate Students and Teaching Assistants. 2 Credit Hours.
An advanced oral skills class designed to help graduate students improve their verbal ability in English for teaching, making presentations, and interacting in academic and professional situations. Credit will not be awarded for both CETL 8796 and CETL 8795.

CETL 8796. Presentation Skills for International Graduate Students. 2 Credit Hours.
This advanced oral skills class is designed to help graduate students improve their presentation skills in English for more effective communication in academic/professinal situations. Credit will not be awarded for both CETL 8795 and CETL 8796.

CETL 8797. Oral Communication for International Graduate Students. 2 Credit Hours.
In this class, students work on fluency, pronunciation clarity, and appropriateness in spoken communication to prepare for effective and confident participation in their academic communities. Credit will not be awarded for both CETL 8797 and CETL 8793.

CETL 8801. Special Topics. 1 Credit Hour.

CETL 8802. Special Topics. 2 Credit Hours.

CETL 8803. Special Topics. 3 Credit Hours.

CETL 8900. Special Problems. 1-21 Credit Hours.
Special problems in current interest.

CETL 8997. Student and Teacher Enhancement Partnership. 1-21 Credit Hours.
This course if for STEP students with an assistantship.

Chemical & Biomolecular Engr (CHBE)

CHBE 1750. Introduction to Bioengineering. 3 Credit Hours.
An introduction to the field of bioengineering, including the application of engineering principles and methods to problems in biology and medicine, the integration of engineering with biology, and the emerging industrial opportunities. Crosslisted with AE, BMED, ECE, ME, and MSE 1750.

CHBE 1801. Special Topics. 1 Credit Hour.
Special Topics in CHBE.

CHBE 1XXX. Chemical and Biomolecular Engineering Elective. 1-21 Credit Hours.

CHBE 2100. Chemical Process Principles. 3 Credit Hours.
Material and energy balances for single-phase and multi-phase processes common to chemical engineering. Phase equilibrium and analysis of reacting systems.

CHBE 2110. Chemical Engineering Thermodynamics I. 3 Credit Hours.
Elements of engineering thermodynamics. First and second laws. Analysis of engineering machinery: compressors, turbines, engines, refrigeration. Credit not allowed for both CHBE 2110 and CHBE 2130.

CHBE 2120. Numerical Methods in Chemical Engineering. 3 Credit Hours.
Numerical methods are introduced and applied to the solution of chemical engineering problems. An introduction to chemical process simulation, and the appropriate software is provided.

CHBE 2130. Chemical Engineering Thermodynamics I. 2 Credit Hours.
Basic principles of chemical engineering thermodynamics including first and second laws, equations of state, PVT properties, power cycles and refrigeration. Credit not allowed for both CHBE 2130 and CHBE 2110.

CHBE 2140. Chemical Engineering Thermodynamics. 4 Credit Hours.
Principles of thermodynamics, including: first and second laws; equations of state; PVT properties; power cycles and refrigeration; phase equilibria; fugacity and activity coefficients; multi-reaction equilibrium.

CHBE 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

CHBE 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

CHBE 2801. Special Topics. 1 Credit Hour.
Topics relevant to chemical engineering not currently covered in the undergraduate curriculum are presented as demand or interest warrants.

CHBE 2801R. CHBE 2801 Recitation. 0 Credit Hours.
Designed to provide time for application of conceptual knowledge and extension of instruction. Optional and non-billable.

CHBE 2803. Special Topics. 3 Credit Hours.
Topics relevant to chemical engineering not currently covered in the undergraduate curriculum are presented as demand or interest warrants.

CHBE 2XXX. Chemical and Biomolecular Engineering Elective. 1-21 Credit Hours.

CHBE 3110. Chemical Engineering Thermodynamics II. 3 Credit Hours.
Phase and chemical reaction equilibria. Vapor-liquid, liquid-liquid, and solid-vapor phase equilibrium Fugacity and activity coefficients. Multi-reaction equilibrium. Credit not allowed for both CHBE 3110 and CHBE 3130.

CHBE 3130. Chemical Engineering Thermodynamics II. 3 Credit Hours.
Basic principles of chemical engineering solution and phase equilibrium thermodynamics, including ideal and non-ideal solution models and phase equilibira calculations (VLE, SLE, LLE). Credit not allowed for both CHBE 3130 and CHBE 3110.

CHBE 3200. Transport Process I. 3 Credit Hours.
Fundamentals of fluid mechanics and heat transfer. The design and analysis of equipment using the principles of fluid mechanics and heat transfer.

CHBE 3205. Fluid Mechanics. 2 Credit Hours.
The basic principles of fluid mechanics are introduced and the analysis and design of equipment using these principles is practiced.

CHBE 3210. Transport Processes II. 3 Credit Hours.
Fundamental principles and applications of mass transfer. The analysis of chemical engineering processes and operations involving mass transfer.

CHBE 3215. Heat & Mass Transfer. 4 Credit Hours.
Fundamental principles and applications of heat and mass transfer. The analysis of chemical engineering processes and operations involving heat and mass transfer.

CHBE 3225. Separations Processes. 3 Credit Hours.
Fundamentals of equilibrium-stage and continuous contacting operations. Applications of principles to distillation, absorption/stripping, extraction, absorption, and other separation technologies.

CHBE 3300. Chemical Kinetics and Catalysis. 2 Credit Hours.
The basic principles of chemical reaction kinetics, including rate laws, mechanisms, and heterogeneous catalysis are introduced.

CHBE 3600. Engineering Ethics and Leadership. 3 Credit Hours.
Development of quantitative and qualitative assessment tools to resolve moral and ethical dilemmas that arise in the performance of engineering duties.

CHBE 3XXX. Chemical and Biomolecular Engineering Elective. 1-21 Credit Hours.

CHBE 4020. Chemical Engineering in Nanoscale Systems. 3 Credit Hours.
Application of chemical processing fundamentals, fabrication, and characterization to design and analyze technologically important nanoscale systems. The course emphasizes an integrated engineering and science approach.

CHBE 4030. Chemical Engineering of Energy Systems. 3 Credit Hours.
Students will acquire the knowledge and tools to analyze CHP systems, traditional power generation, refinery and biorefinery configurations and advanced power generation and storage options.

CHBE 4050. The Science and Engineering of Microelectronic Fabrication. 3 Credit Hours.
An elective class for students interested in fabrication of semiconductor devices focusing on the fundamentals of materials synthesis, chemical and mechanical properties, and chemical reactions. Credit will not be awarded for both CHBE 4050 and CHBE 6050.

CHBE 4200. Unit Operations Laboratory. 3 Credit Hours.
This course illustrates engineering/scientific principles and physical models important to the data collection/ interpretation of processes important to the practice of chemical engineering.

CHBE 4210. Transport Phenomena / Bioprocess Unit Operations. 3 Credit Hours.
This course illustrates engineering/scientific principles and physical models important to the data collection/interpretation of processes important in biotechnology.

CHBE 4300. Kinetics and Reactor Design. 3 Credit Hours.
Reacting systems are analyzed in terms of reaction mechanisms, kinetics, and reactor design. Both homogeneous and heterogeneous reactions are considered.

CHBE 4310. Bioprocess Engineering. 3 Credit Hours.
Integrating several ChBE core concepts, bioprocess engineering applies the material to biological systems. Items covered are enzyme kinetics, fermentation, downstream processing, and integrated bioprocesses important to the biotech industries.

CHBE 4320. Reactor Design. 2 Credit Hours.
The basic principles of reactor design are introduced, including material and energy balances for homogeneous and heterogeneous systems.

CHBE 4400. Chemical Process Control. 4 Credit Hours.
Dynamics of chemical processes and their control. Techniques of conventional process control as well as digital control. Laboratory experiments to illustrate these concepts.

CHBE 4411. Process Dynamics and Control. 3 Credit Hours.
Dynamics of chemical processes and their control. Techniques of conventional process control as well as digital control.

CHBE 4412. Process Dynamics and Control Laboratory. 1 Credit Hour.
Dynamics of chemical processes and their control. Techniques of conventional process control as well as digital control. Laboratory experiments would illustrate these concepts.

CHBE 4505. Process Design and Economics. 3 Credit Hours.
Principles of flowsheet synthesis and economic analysis and optimization. A complete design on a chemical process will be undertaken, including concepts of unit operations, design, economics, and safety. Credit not allowed for both CHBE 4505 and CHBE 4530 (or CHBE 4520).

CHBE 4510. Process and Product Design And Economics. 2 Credit Hours.
Basic principles of chemical process and product design including heuristic design approaches, heat exchanger network design, optimization, and economic evaluation. Credit not allowed for both CHBE 4510 and CHBE 4505 (or CHBE 4525).

CHBE 4515. Chemical Process Safety. 1 Credit Hour.
Fundamental sources of chemical hazards and degree of risk. Process design and hazard avoidance are used to reduce risk.

CHBE 4520. Chemical Engineering Capstone Design Project. 2 Credit Hours.
Basic principles of chemical process and product design including heuristic design approaches heat exchanger network design, optimization, and economic evaluation. Credit not allowed for both CHBE 4520 and CHBE 4505 (or CHBE 4525).

CHBE 4525. Bioprocess Design and Economics. 3 Credit Hours.
Principles of flowsheet synthesis and economic analysis and optimization. A complete design of a biochemical process will be undertaken, including concepts of unit operations, design, economics, and safety. Credit not allowed for both CHBE 4525 and CHBE 4530 (or CHBE 4520).

CHBE 4530. Capstone ChBE Bio-Design. 2 Credit Hours.
Basic principles of chemical process and product design including heuristic design approaches, heat exchanger network design, optimization, and economic evaluation. Credit not allowed for both CHBE 4530 and CHBE 4505 (or 4525).

CHBE 4535. Chemical Product Design, Engineering and Optimization. 3 Credit Hours.
Chemical engineering principles applied to the design of products.

CHBE 4573. Pulping and Bleaching Laboratory. 2 Credit Hours.
Experiments of pulping, bleaching, fiber, and chemical testing are performed. Hands-on experience from chip preparation, cooking, pulp processing, and bleaching are provided.

CHBE 4574. Papermaking and Recycled Pulp Laboratory. 2 Credit Hours.
Experiments of pulp preparation, refining, paperforming, handsheet testing, deinking, and recycled pulp processing are performed. Small paper machine operation will be taught.

CHBE 4600. Effective Communication for Professional Engineering. 3 Credit Hours.
How engineers communicate with engineering and non-engineering professionals. Industry speakers from different fields. Engineering case study. Weekly written and/or oral presentations.

CHBE 4610. Complex Fluids - Microstructure and Mechanical Properties. 3 Credit Hours.
Complex fluids have interesting, practically relevant mechanical properties that arise from complex microstructures. This course covers fundamental physical principles, experimental characterization techniques and current topics.

CHBE 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

CHBE 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

CHBE 4710. Microfluidics and Bio Applications. 3 Credit Hours.
The course focuses on the fluid and flow aspects of micro and nano devices. It will cover basic micro/nanofabrication techniques, introduce transport of momentum and materials (including charged and magnetic materials) in small scale, and the applications in biology and medicine.

CHBE 4720. Pulp and Paper Manufacturing. 3 Credit Hours.
The course provides comprehensive foundational knowledge of the industry enabling the student to understand the role of diverse manufacturing operations and to strategically plan improvements.

CHBE 4730. Emerging Technologies for Forest Bioproducts. 3 Credit Hours.
The course provides comprehensive knowledge of the manufacture of nontraditional products from forest biomaterials. It analyzes and assesses emerging manufacturing technologies, materials and products.

CHBE 4743. Fundamentals and Challenges for a Sustainable Chemical Enterprise. 3 Credit Hours.
Life Cycle Inventory methodology will be explored as a means to develop new, sustainable products, materials and manufacturing processes.

CHBE 4745. Data Analytics for Chemical Engineers. 3 Credit Hours.
Introduction to data analytics and machine learning techniques for chemical engineers. Application of basic regression, classification, dimensional reduction, and clustering techniques to chemical data sets.

CHBE 4746. Data-Driven Process Systems Engineering. 3 Credit Hours.
This course covers theory of optimization and data-driven modeling methods, and examples of data-driven decision-making in the chemical process industry.

CHBE 4752. Integrated Circuit Fabrication. 3 Credit Hours.
The objective of this course is to give students exposure to the various steps involved in the fabrication of integrated circuits and devices. This course will include a laboratory segment in which students fabricate MOS transistors, diffused resistors, and MOS capacitors from a bare silicon substrate. Crosslisted with ECE 4752.

CHBE 4755. Electronic Packaging Substrate Fabrication. 3 Credit Hours.
This course provides hands-on instruction in basic packaging substrate fabrication techniques, including interconnect design and testing, dielectric deposition, via formation, and metallization. Crosslisted with ECE 4755.

CHBE 4757. Biofluid Mechanics. 3 Credit Hours.
Introduction to the study of blood flow in the cardiovascular system. Emphasis on modeling and the potential of flow studies for clinical research application. Crosslisted with AE and ME 4757.

CHBE 4758. Biosolid Mechanics. 3 Credit Hours.
The mechanics of living tissue, e.g., arteries, skin, heart muscle, ligament, tendon, cartilage, and bone. Constitutive equations and some simple mechanical models. Mechanics of cells. Applications. Crosslisted with AE and ME 4758.

CHBE 4759. Electrochemical Energy Storage and Conversion. 3 Credit Hours.
An elective class for senior-level students interested in electrochemical storage and covnersion, including the fundamentals of electrochemistry and practical battery and fuel cells.

CHBE 4760. Biocatalysis and Metabolic Engineering. 3 Credit Hours.
This course provides an in-depth coverage of various topics in biocatalysis and metabolic engineering. Goals of this course are the development of an understanding of proteins as catalysts, their functioning in metabolic networks, their application in various industries, recognition of their potential for addressing future challenges in science and engineering. Crosslisted with CHEM 4760.

CHBE 4762. Protein Engineering. 3 Credit Hours.
This course covers the theory and practice of protein engineering methods, including specific examples of engineered proteins and their applications from the literature.

CHBE 4763. Pulping and Chemical Recovery. 3 Credit Hours.
Pulping and chemical recovery processes are studied on the reaction, delignification, energy, and liquor reuse. The process optimization, air and water pollution minimization are taught. Crosslisted with ME 4763.

CHBE 4764. Bleaching and Papermaking. 3 Credit Hours.
Pulp bleaching and formation of paper/board products are studied along with testing, end uses, chemical and mechanical treatment of pulp, non-wood and recycled fiber utilization. Crosslisted with ME 4764.

CHBE 4765. Drug Design, Development and Delivery. 3 Credit Hours.
Introduction to the pharmaceutical development process, including design of new drugs, synthesis and manufacturing issues, and methods for delivery into the body. Includes student presentations. Crosslisted with CHEM and BMED 4765.

CHBE 4767. Pulp And Paper Lab. 3 Credit Hours.
Fundamentals of pulp and paper testing procedures.

CHBE 4770. Nuclear Chemical Engineering. 3 Credit Hours.
This course surveys the chemical engineering aspects of nuclear power. Topics include nuclear reactions, fuel cycles, solvent extraction of metals, the properties of actinides and other irradiated fuel materials, fuel reprocessing, and radioactive waste management. Crosslisted with NRE 4770.

CHBE 4775. Polymer Science and Engineering I: Formation and Properties. 3 Credit Hours.
An introduction to the chemistry, structure, and formation of polymers, physical states and transitions, physical and mechanical properties to polymer fluids and solids. Crosslisted with CHEM, ME, MSE, and PTFE 4775.

CHBE 4776. Polymer Science and Engineering II: Analysis, Processing and Laboratory. 3 Credit Hours.
Polymer fabrication processes and methods of characterization and identification of polymers are presented. Experiments in polymerization, processing and property evaluation of polymers. Crosslisted with CHEM, ME, MSE, and TFE 4776.

CHBE 4781. Biomedical Instrumentation. 3 Credit Hours.
A study of medical instrumentation from a systems viewpoint. Pertinent physiological and electro-physiological concepts will be covered. Credit not allowed for both CHBE 4781 and (CHE 4781 or ECE 4781 or BMED 4781 or ME 4781).

CHBE 4782. Biosystems Analysis. 3 Credit Hours.
Analytical methods for modeling biological systems, including white-noise protocols for characterizing nonlinear systems. Crosslisted with BMED, ECE and ME 4782.

CHBE 4791. Mechanical Behavior of Composites. 3 Credit Hours.
Stress-strain behavior of composites, property of matrix and reinforcing materials, mechanics of fiber-reinforced composites, lamina and laminate analysis, and mechanical performance. Crosslisted with AE, CEE, ME, MSE, and PTFE 4791.

CHBE 4793. Composite Materials and Processes. 3 Credit Hours.
Basic principles of selection and design of composite materials and their manufacturing and testing. Cost factors. Laboratory exercises on manufacturing and tests. Crosslisted with AE, CEE, ME, MSE, and PTFE 4793.

CHBE 4794. Composite Materials and Manufacturing. 4 Credit Hours.
Basic principles of selection and design of composite materials and their manufacturing and testing. Cost factors. Laboratory exercises on manufacturing and tests. Crosslisted with AE, CEE, ME, MSE, and PTFE 4794.

CHBE 4801. Special Topics. 1 Credit Hour.
Topics relevant to chemical engineering not currently covered in the undergraduate curriculum are presented as demand or interest warrants.

CHBE 4802. Special Topics. 2 Credit Hours.
Topics relevant to chemical engineering not currently covered in the undergraduate curriculum are presented as as demand or interest warrants.

CHBE 4803. Special Topics. 3 Credit Hours.
Topics relevant to chemical engineering not currently covered in the undergraduate curriculum are presented as demand or interest warrants.

CHBE 4804. Special Topics. 4 Credit Hours.
Topics relevant to chemical engineering not currently covered in the undergraduate curriculum are presented as demand or interest warrants.

CHBE 4805. Special Topics. 5 Credit Hours.
Topics relevant to chemical engineering not currently covered in the undergraduate curriculum are presented as demand or interest warrants.

CHBE 4806. Special Topics. 6 Credit Hours.
Topics relevant to chemical engineering not currently covered in the undergraduate curriculum are presented as demand or interest warrants.

CHBE 4853. Special Topics. 3 Credit Hours.
Topics relevant to chemical engineering not currently covered in the undergraduate curriculum are presented as demand or interest warrants.

CHBE 4873. Special Topics. 3 Credit Hours.
Topics relevant to chemical engineering not currently covered in the undergraduate curriculum are presented as demand or interest warrants.

CHBE 4901. Special Problems. 1-21 Credit Hours.
The student is given an opportunity to develop initiative and to apply fundamental principles by doing semioriginal laboratory or theoretical investigation of a chemical engineering problem.

CHBE 4902. Special Problems. 1-21 Credit Hours.
The student is given an opportunity to develop initiative and to apply fundamental principles by doing semioriginal laboratory or theoretical investigation of a chemical engineering problem.

CHBE 4903. Special Problems. 1-21 Credit Hours.
The student is given an opportunity to develop initiative and to apply fundamental principles by doing semioriginal laboratory or theoretical investigation of a chemical engineering problem.

CHBE 4XXX. Chemical and Biomolecular Engineering Elective. 1-21 Credit Hours.

CHBE 6001. Introdcution to Research and Resposible Conduct of Research for ChBE Graduate Students. 1 Credit Hour.
This course introduces ChBE graduate students to topics that will be encountered in research and fulfills RCR (responsible conduct of reseach) in-person training requirements.

CHBE 6003. Chemical Process Safety. 1 Credit Hour.
The course focuses on risk reduction through design and hazard avoidance. Sources of chemical hazards and risks are discussed.

CHBE 6004. Communication Skills for Technical Problem Solving. 1 Credit Hour.
Applications of both written and oral communication skills to the solution of technical problems. Includes focus, audience analysis, visual aids, and organization.

CHBE 6020. Chemical Engineering in Nanoscale Systems. 3 Credit Hours.
Application of chemical processing fundamentals, fabrication, and characterization to design and analyze technologically important nanoscale systems. The course emphasizes an integrated engineering and science approach.

CHBE 6030. Chemical Engineering of Energy Systems. 3 Credit Hours.
Students will acquire the knowledge and tools to analyze CHP systems, traditional power generation, refinery and biorefinery configurations and advanced power generation and storage options.

CHBE 6050. The Science and Engineering of Microelectronic Fabrication. 3 Credit Hours.
An elective class for students interested in fabrication of semiconductor devices focusing on the fundamentals of materials synthesis, chemical and mechanical properties, and chemical reactions. Credit will not be awarded for both CHBE 6050 and CHBE 4050.

CHBE 6100. Advanced Chemical Engineering Thermodynamics. 3 Credit Hours.
Equations of state, corresponding states, and activity coefficient models and their relationship to intermolecular forces. Phase and chemical equilibria in chemical engineering.

CHBE 6110. Thermodynamics of Systems of Large Molecules. 3 Credit Hours.
Classical and statistical thermodynamics of systems that are important in chemical, biochemical, and polymer processing.

CHBE 6120. Molecular Modeling. 3 Credit Hours.
Introduction to computational chemistry techniques for modeling substances at the molecular level, including: ab initio and semiempirical quantum methods, molecular dynamics, and Monte Carlo methods.

CHBE 6130. Electrochemical Engineering. 3 Credit Hours.
Electrochemical thermodynamics and kinetics. Corrosion. Applications to semiconductor devices, fuel cells, and batteries.

CHBE 6200. Advanced Transport Phenomena, Fluid Mechanics, and Heat. 3 Credit Hours.
Transfer Viscous fluid mechanics and convective heat transfer. Scaling analysis and lubrication. Stokes, and boundary layer flows. Transport about solid bodies. Linear stability theory.

CHBE 6210. Fluid Mechanics of Two-Phase Flow. 3 Credit Hours.
Two-phase flow of nondeformable particles in Newtonian fluids. Rigorous results in the limit of small Reynolds number motions and applications to suspensions and colloids.

CHBE 6220. Computational Fluid Dynamics: Applications in Environmental. 3 Credit Hours.
Applications in Environmental and Chemical Processes. Introduction to numerical methods for solving transport problems. Applications to problems of interest in environmental and chemical processes.

CHBE 6229. Introduction to MEMS. 3 Credit Hours.
Introduction to Micro-Electro-Mechanical Systems: Microfabrication techniques including: photolithography, etching, physical and chemical vapor deposition, electroplating, bonding and polymer processing. Application to sensors and actuators.

CHBE 6230. Industrial Emissions Control. 3 Credit Hours.
Analysis of air quality criteria, ambient and emission standards, and industrial pollution sources. Recovery and utilization of waste gases and particulate matter.

CHBE 6231. Environmental Modeling in the Forest Products Industry. 3 Credit Hours.
The science and engineering of waste treatment processes in the pulp and paper industry.

CHBE 6232. Chemical Engineering Processes in Pulp & Paper Manufacturing. 3 Credit Hours.
To study the details of some of the major unit operations in pulp and paper manufacturing.

CHBE 6240. Advanced Separation Processes. 3 Credit Hours.
This course provides an advanced analysis of separation process technology, with special emphasis on new separation techniques and their applications.

CHBE 6250. Mass Transport through Solids. 3 Credit Hours.
An in-depth introduction to transport of penetrants in and through solids. Convective flow through porous media, and conductive flow through homogenous solids. Membrane separations.

CHBE 6260. Transport Phenomena-Mass Transfer. 3 Credit Hours.
Mass transport processes and material properties that affect them. Principles of both steady- and unsteady-state molecular diffusion are developed and transfer mechanisms examined.

CHBE 62X0. Xfer-Separation Process. 2 Credit Hours.

CHBE 62X1. Xfer-Env Mod Forest Ind. 2 Credit Hours.

CHBE 6300. Kinetics and Reactor Design. 3 Credit Hours.
A study of chemical kinetics and mechanisms in complex homogeneous and heterogeneous reaction systems. Design and analysis of chemical reactors for such systems.

CHBE 6310. Applied Chemical Kinetics. 3 Credit Hours.
Applications of chemical kinetics to homogeneous and heterogeneous gas and liquid reactions, including techniques and analyses.

CHBE 6320. Heterogeneous Catalysis. 3 Credit Hours.
Physics and chemistry of surfaces; thermodynamics, kinetics, and mechanism of adsorption and surface reactions; modern instrumental analyses; and industrial catalysis.

CHBE 6400. Advanced Process Control. 3 Credit Hours.
Fundamentals of multivariate control theory as applied to chemical processes.

CHBE 6410. Dynamic Behavior of Process Systems. 3 Credit Hours.
Introduction to process dynamics. Modeling of lumped systems with and without chemical reactions. Lumped processes involving phase equilibrium. Distributed parameter systems. Optimization of transient processes.

CHBE 6460. Microelectromechanical Devices. 3 Credit Hours.
Introduces fundamental concepts and tools needed for the design, simulation and analysis of MEMS devices. These include electrical, mechanical, radiant, thermal, magnetic and chemical domains. Credit not allowed for both CHBE 6460 and ME 6460 or ECE 6460.

CHBE 6500. Mathematical Modeling and Analysis of Chemical Processes. 3 Credit Hours.
Formulation and solution of mathematical models of a range of chemical processes with an emphasis on differential balances and incorporation of uncertainty.

CHBE 6600. Polymerization Reaction Engineering. 3 Credit Hours.
Polymerization processes are analyzed with regard to reaction mechanism, kinetics, and reactor design. Control of polymer structure during polymerization is emphasized.

CHBE 6608. Semiconductor Microlithography and Patterning. 3 Credit Hours.
The study of fundamental issues from physics, chemistry, chemical engineering, and electrical engineering inherent in semiconductor microlithography, encompassing both materials and processes used for pattern definition.

CHBE 6609. Polymers in Microelectronics. 3 Credit Hours.
Use of polymers in microelectronics applications such as photolithography, interlevel dielectrics, encapsulation, packaging, magnetic media, and optical storage.

CHBE 6610. Complex Fluids - Microstructure and Mechanical Properties. 3 Credit Hours.
Complex fluids have interesting, practically relevant mechanical properties that arise from complex microstructures. This course covers fundamental physical principles, experimental characterization techniques and current topics.

CHBE 6634. Wet End Processing of Paper. 3 Credit Hours.
Wet end colloidal and polymer science of papermaking processes. Processing with fiber, mineral fillers, brighteners, and polymer additives.

CHBE 66X0. Xfer-Pulp-Paper Mfg I. 2 Credit Hours.

CHBE 66X1. Xfer-Pulp-Paper Mfg II. 2 Credit Hours.

CHBE 66X4. Xfer-Wet End Proc-Paper. 2 Credit Hours.

CHBE 66X7. Transfer-Bioprocessing. 3 Credit Hours.

CHBE 6701. Foundational Topics in the Manufacturing of Forest Bioproducts. 3 Credit Hours.
The course provides comprehensive foundational knowledge of the industry enabling the student to understand the role of diverse manufacturing operations and to strategically plan improvements. Course is cross-listed with MLDR 6701, CHBE 6741, ME 6741, CHEM 6741, MSE 6741, CHBE 6742, ME 6742, CHEM 6742, MSE 6742.

CHBE 6710. Microfluidics & Appl. 3 Credit Hours.
This course explores the fundamentals of microfluidics and nanofluidics, and their applications, primarily in biological and medical sciences (e.g. biomolecular separations). Credit not allowed for both CHBE 6710 and CHBE 4710.

CHBE 6741. Pulp and Paper Manufacture I. 3 Credit Hours.
The fundamentals of pulp and paper technology are presented. Applications to the several unit operations used are explored and augmented by field trips and recent case studies. Crosslisted with ME 6741, CHBE 6701 and MLDR 6701.

CHBE 6742. Pulp and Paper Manufacture II. 3 Credit Hours.
Papermaking technology is covered from a multidisciplinary engineering perspective with fundamental and practical considerations being addressed. Students participate in groups to run a pilot papermaking trial at the Henry Foundation in Savannah. Crosslisted with ME 6741, CHBE 6701 and MLDR 6701.

CHBE 6743. Fundamentals and Challenges for a Sustainable Chemical Enterprise. 3 Credit Hours.
Life Cycle Inventory methodology will be explored as a means to develop new, sustainable products, materials and manufacturing processes.

CHBE 6745. Data Analytics for Chemical Engineers. 3 Credit Hours.
Introduction to data analytics and machine learning techniques for chemical engineers. Application of basic regression, classification, dimensional reduction, and clustering techniques to chemical data sets.

CHBE 6746. Data-Driven Process Systems Engineering. 3 Credit Hours.
This course covers theory of optimization and data-driven modeling methods, and examples of data-driven decision-making in the chemical process industry.

CHBE 6750. Preparation and Reactions of Polymers. 3 Credit Hours.
A detailed treatment of the reactions involved in the synthesis of both human-made and natural polymers, including preparation and degradative reactions of polymer systems. Crosslisted with CHEM and PTFE 6750.

CHBE 6751. Physical Chemistry of Polymer Solutions. 3 Credit Hours.
Study of polymer solutions, polymer miscibility, adsorption, sorption, plasticization, molecular weights, molecular weight distributions, and interfacial phenomena using thermodynamics and statistical mechanics. Crosslisted with CHEM, MSE, and PTFE 6751.

CHBE 6752. Polymer Characterization. 4 Credit Hours.
This course introduces the student to surface, near-surface and structural methods of polymer characterization. Specialized techniques critical to physical structure are emphasized. Crosslisted with CHEM, MSE, and PTFE 6752.

CHBE 6757. Advanced Polymer Chemistry. 3 Credit Hours.
Advanced topics in synthetic polymerization methodology, polymer structure, and polymer properties in solution and the solid state.

CHBE 6759. Plasma Processing of Electronic Materials and Devices. 3 Credit Hours.
Fundamental physics, chemistry, chemical engineering, and electrical engineering principles inherent in plasma processes. Includes etching, deposition, diagnostic methods, and control schemes. Crosslisted with ECE 6759.

CHBE 6760. Biocatalysis and Metabolic Engineering. 3 Credit Hours.
This course provides in-depth coverage of various topics in biocatalysis and metabolic engineering. Goals of this course are the development of an understanding of proteins as catalysts, their functioning in metabolic networks, their application in various industries, and recognition of their potential for addressing future challenges in science and engineering. Crosslisted with CHEM 6760.

CHBE 6762. Protein Engineering. 3 Credit Hours.
This course covers the theory and practice of protein engineering methods, including specific examples of engineered proteins and their applications from the literature.

CHBE 6765. Drug Design, Development and Delivery. 3 Credit Hours.
Introduction to the pharmaceutical development process, including design of new drugs, synthesis and manufacturing issues, and methods of delivery into the body. Includes student presentations. Crosslisted with BMED 6765 and CHBE 6765.

CHBE 6768. Polymer Structure, Physical Properties and Characterization. 3 Credit Hours.
Formulations and analysis of molecular and phenomenological models of elastic and viscoelastic behavior, development and description of structure, and fundamental aspects of structure-property relations. Crosslisted with ME, PTFE, and MSE 6768.

CHBE 6774. Biomaterials: Structure and Function. 3 Credit Hours.
Structure-function relationships of biomaterials and biomaterial characterization will be covered. Materials for medical implants, tissue engineering, biosensing, imaging, and drug delivery will be covered. Crosslisted with BMED, ME, and MSE 6774.

CHBE 6777. Advanced Biomaterials. 3 Credit Hours.
Advanced topics of biomaterials performance and engineering, including biointerfaces, host reactions of materials, and bio-inspired/smart-materials strategies. Crosslisted with BMED, ME, and MSE 6777.

CHBE 6778. Introduction to Biomaterials. 3 Credit Hours.
Introduction to a variety of biomaterials and their biomedical applications. Crosslisted with BMED and PTFE 6778.

CHBE 6779. Bioprocess Engineering. 3 Credit Hours.
Study of enzymes and microbial and mammalian cells for production of biochemicals and protein therapeutics in bioreactors; downstream separation and purification; integrated view of bioprocesses. Crosslisted with BMED 6779.

CHBE 6782. Cellular Engineering. 3 Credit Hours.
Engineering analysis of cellular systems. Crosslisted with BMED and ME 6782.

CHBE 6784. Cardiovascular Biomechanics. 3 Credit Hours.
Mechanical analysis of the cardiovascular system emphasizing the normal and pathologic function in relation to clinical cardiovascular medicine. Crosslisted with BMED and ME 6784.

CHBE 6793. Systems Pathophysiology. 3 Credit Hours.
Overview of human pathophysiology from a quantitative perspective. A brief introduction to the application of quantitative models to the understanding of biological systems. Crosslisted with BMED, ECE, and ME 6793.

CHBE 6794. Tissue Engineering. 3 Credit Hours.
Biological, engineering, and medical issues in developing tissue-engineered constructs. Emphasis on the integration of these disciplines at a basic molecular and cell biology level. Crosslisted with CHE and ME 6794.

CHBE 6800. Pharmaceutical development: from drug lead to drug product. 3 Credit Hours.
We address the multifaceted process of bringing a drug from concept to market through open-ended, student-driven, collaborative projects addressing real-world problems in pharmaceutical development.

CHBE 6XXX. Chemical and Biomolecular Engineering Elective. 1-21 Credit Hours.

CHBE 7000. Master's Thesis. 1-21 Credit Hours.

CHBE 7650. Advanced Physical Chemistry of Polymers. 3 Credit Hours.
Thermodynamics and microscopic dynamics of polymers. Fundamental concepts, including scaling concepts, governing anisotropy of polarizability, phase transitions, morphology, time-dependent correlations, etc.

CHBE 7721. Are You Thinking of Becoming An Academic?. 1 Credit Hour.
How to run a successful research program, advise students, apply and get a job in academia, navigate promotion and tenure, and other aspects of academia.

CHBE 7757. Teaching Practicum. 3 Credit Hours.
Supervised teaching for doctoral students. Teaching techniques, course and curriculum design, student evaluation methods and criteria. Students may, in some instances, prepare and present lectures. Crosslisted with NRE, ME, HP 7757.

CHBE 7771. Mechanics of Polymer Solids and Fluids. 3 Credit Hours.
Continuum mechanics of solids and fluids; mechanics of deformation of anisotropic polymers; yield, breaking, and fatigue; non-Newtonian viscous and viscoelastic behavior of polymer fluids. Crosslisted with ME, MSE, and PTFE 7771.

CHBE 7772. Fundamentals of Fracture Mechanics. 3 Credit Hours.
Advanced study of failure of structural materials under load, mechanics of fracture, and microscopic and macroscopic aspects of the fracture of engineering materials. Crosslisted with AE, CEE, ME, and MSE 7772.

CHBE 7773. Advanced Fracture Mechanics. 3 Credit Hours.
Nonlinear fracture mechanics including elastic-plastic and time-dependent fracture, advanced test methods, J-integral theory, and extensions. Crosslisted with AE, CEE, ME, and MSE 7773.

CHBE 7774. Fatigue of Materials and Structures. 3 Credit Hours.
Mechanical and microstructural aspects of nucleation and growth of cracks under cyclic loading conditions, notch effects, cumulative damage, multiaxial loading, and fatigue crack propagation. Crosslisted with AE, CEE, ME, and MSE 7774.

CHBE 7775. Topics in Fracture and Fatigue of Metallic and Composite. 3 Credit Hours.
Structures Brittle and ductile failure criteria. Failure prediction in composite structures. Free-edge and internal delamination. Anisotropic cracks. Fatigue behavior of composites and comparison with metal fatigue. Crosslisted with AE, ME, and MSE 7775.

CHBE 7791. Damage, Failure, and Durability of Composite Materials. 3 Credit Hours.
Provides knowledge of the fundamental concepts and methods related to analysis and assessment of damage, failure, and durability of composite materials. Crosslisted with AE, CEE, ME, MSE, and PTFE 7791.

CHBE 7792. Advanced Mechanics of Composites. 3 Credit Hours.
Anisotropic elasticity, failure theories, hydrothermal behavior, 3-D analysis of laminates, thick laminates, free- edge effects, stress concentrations, joints, creep, and fracture of composites, and advanced topics. Crosslisted with AE, CEE, ME, MSE, and PTFE 7792.

CHBE 7793. Manufacturing of Composites. 3 Credit Hours.
Major manufacturing techniques for metal, ceramic, and polymer matrix composites. Modeling of processes with emphasis on fundamental mechanisms and effects. Crosslisted with AE, CEE, ME, MSE, and PTFE 7793.

CHBE 8001. Seminar in Chemical Engineering. 1 Credit Hour.
Seminars involving current research projects presented by graduate students, faculty, and invited speakers.

CHBE 8002. Seminar in Chemical Engineering. 1 Credit Hour.
Seminars involving current research projects presented by graduate students, faculty, and invited speakers.

CHBE 8801. Special Topics. 1 Credit Hour.

CHBE 8802. Special Topics. 2 Credit Hours.

CHBE 8803. Special Topics. 3 Credit Hours.

CHBE 8804. Special Topics. 4 Credit Hours.

CHBE 88X2. Xfer - Special Topics. 2 Credit Hours.

CHBE 8901. Special Problems. 1-21 Credit Hours.

CHBE 8902. Special Problems. 1-21 Credit Hours.
Special Problems for Chemical and Biomolecular Engineering.

CHBE 8997. Teaching Assistantship. 1-9 Credit Hours.
For graduate students holding teaching assistantships.

CHBE 8998. Research Assistantship. 1-9 Credit Hours.
For graduate students holding research assistantships.

CHBE 9000. Doctoral Thesis. 1-21 Credit Hours.

Chemistry (CHEM)

CHEM 1211K. Chemical Principles I. 4 Credit Hours.
Topics to be covered include atomic structure, bonding, properties of matter, thermodynamics and physical equilibria. Laboratory exercises supplement the lecture material. Credit not allowed for both CHEM 1310 and CHEM 1211K.

CHEM 1211R. Chemical Principles I Recitation. 0 Credit Hours.
Recitation to support the conceptual and algorithmic foundations of Chemical Principles I with additional focus on study skills and general problem-solving approaches.

CHEM 1212K. Chemical Principles II. 4 Credit Hours.
Topics to be covered include chemical equilibria, acids and bases, aqueous equilibria, electrochemistry, kinetics, main group and transition elements. Laboratory exercises supplement the lecture material. Credit not allowed for CHEM 1311/1312 and CHEM 1212K.

CHEM 1212R. Chemical Principles II Recitation. 0 Credit Hours.
Recitation to support the conceptual and algorithmic foundations of Chemical Principles II with additional focus on study skills and general problem-solving approaches.

CHEM 12X1. Transfer General Chem. 4 Credit Hours.

CHEM 1310. Principles of General Chemistry for Engineers. 4 Credit Hours.
A first course in chemistry, surveying its fundamental laws and theories, for some engineering majors. It can serve as the first course in a two course sequence where CHEM 1315 is the second course. Topics include atomic structure; bonding theory; stoichiometry; properties of solids, liquids and gases; chemical thermodynamics; electrochemistry; and kinetics. Credit not allowed for both CHEM 1310 and CHEM 1211K.

CHEM 1315. Survey of Organic Chemistry for Engineers. 3 Credit Hours.
Second or third course in chemistry for some engineering majors. The principles of organic chemistry will be surveyed as a basis for understanding materials, biochemical processes and applications. Credit not awarded for both CHEM 1315 and CHEM 2311.

CHEM 1801. Special Topics. 1 Credit Hour.

CHEM 1802. Special Topics. 2 Credit Hours.

CHEM 1803. Special Topics. 3 Credit Hours.

CHEM 1XXX. Chemistry Elective. 1-21 Credit Hours.

CHEM 2211. Introduction to Quantitative Analysis. 3 Credit Hours.
Laboratory experimentation emphasizing quantitative chemical analysis. Credit not allowed for both CHEM 2211 and CHEM 1313.

CHEM 2214. Quantitative Chemical Analysis. 4 Credit Hours.
Theory and laboratory of quantitative chemical analysis.

CHEM 2214R. CHEM 2214 Recitation. 0 Credit Hours.
Recitation for Theory and laboratory of quantitative chemical analysis.

CHEM 2216. Quantitative Chemical Analysis. 2 Credit Hours.
Theory of quantitative chemical analysis.

CHEM 2216L. Quantitative Chemical Analysis Laboratory. 2 Credit Hours.
Laboratory practice of quantitative chemical analysis.

CHEM 2216R. Quantitative Chemical Analysis Recitation. 0 Credit Hours.
Recitation to support the theory of quantitative chemical analysis.

CHEM 2311. Organic Chemistry I. 3 Credit Hours.
An introduction to structure and reactivity of organic molecules. Credit not awarded for both CHEM 2311 and CHEM 1315.

CHEM 2312. Organic Chemistry II. 3 Credit Hours.
The second course in the series dealing with the structure and reactivity of organic molecules. Credit not awarded for both CHEM 2312 and CHEM 2313.

CHEM 2313. Organic and Bioorganic Chemistry. 3 Credit Hours.
A second course in organic chemistry that extends the study to topics in biochemistry. Credit not awarded for both CHEM 2313 and CHEM 2312.

CHEM 2380. Synthesis Laboratory I. 2 Credit Hours.
Methods for preparation, isolation, and characterization of complex organic molecules, natural products, and polymers.

CHEM 2380U. Synthesis Laboratory I. 2 Credit Hours.
Methods for preparation, isolation, and characterization of complex organic molecules, natural products, and polymers. Please note: This is the summer version of CHEM 2380-Synthesis Lab I.

CHEM 2601. Professional Skills for Chemists and Biochemists. 1 Credit Hour.
An introduction to technical and communication skills utilized in upper level chemistry and biochemistry courses with additional focus on resume building and professional development.

CHEM 2694. Intern Assistantship (Undergraduate Internship for Pay). 1-21 Credit Hours.
Undergraduate Internship for which the student is paid, Freshmen and Sophomores only.

CHEM 2695. Undergraduate Internship (Undergraduate Internship for Academic Credit). 1-21 Credit Hours.
Undergraduate Internship for academic credit, Freshmen and Sophomores only.

CHEM 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

CHEM 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

CHEM 2801. Special Topics. 1 Credit Hour.
Lecture course in current special topics in chemistry and biochemistry. Topics will vary from year to year.

CHEM 2802. Special Topics. 2 Credit Hours.
Lecture course in current special topics in chemistry and biochemistry. Topics will vary from year to year.

CHEM 2803. Special Topics. 3 Credit Hours.
Lecture course in current special topics in chemistry and biochemistry. Topics will vary from year to year.

CHEM 2804. Special Topics. 4 Credit Hours.
Lecture course in current special topics in chemistry and biochemistry. Topics will vary.

CHEM 2812. Special Topics. 2 Credit Hours.
Lecture course in current special topics in chemistry and biochemistry. Topics will vary from year to year.

CHEM 2832. Special Topic. 2 Credit Hours.
Lecture course in current special topics in chemistry and biochemistry. Topics will vary.

CHEM 2901. Special Problems in Chemistry. 1-21 Credit Hours.
Course of individual instruction, which will include library conference and laboratory experience.

CHEM 2902. Special Problems in Chemistry. 1-21 Credit Hours.
Course of individuated instruction, which will include library, conference and laboratory experience.

CHEM 2903. Special Problems in Chemistry. 1-21 Credit Hours.
Course of individuated instruction, which will include library conference and laboratory experience.

CHEM 2XXX. Chemistry Elective. 1-21 Credit Hours.

CHEM 3111. Inorganic Chemistry. 3 Credit Hours.
A study of the reactions and structures of inorganic compounds and principles, generalizations and theories that assist in understanding their behavior.

CHEM 3211. Analytical Chemistry. 5 Credit Hours.
Introduction to the theory and practice of modern chemical analysis.

CHEM 3216. Analytical Chemistry Lecture. 3 Credit Hours.
Introduction to the theory of modern chemical analysis.

CHEM 3216L. Analytical Chemistry Laboratory. 2 Credit Hours.
Introduction to the practice of modern chemical analysis.

CHEM 3281. Instrumental Analysis for Engineers. 4 Credit Hours.
Provides a background to modern analytical chemistry and instrumental methods of analysis with applications to engineering and other areas.

CHEM 3371. Organic Chemistry Laboratory. 2 Credit Hours.
Multi-step organic synthesis and inorganic synthesis. Use of chemical literature and advanced spectroscopic techniques.

CHEM 3380. Synthesis Laboratory II. 3 Credit Hours.
Multi-step organic and inorganic synthesis. Use of the chemical literature and advanced spectroscopic techniques.

CHEM 3411. Physical Chemistry I. 3 Credit Hours.
Chemical thermodynamics, energetics of chemical reactions, changes of state, and electrochemistry.

CHEM 3412. Physical Chemistry II. 3 Credit Hours.
Quantum mechanics, atomic and molecular structure, bonding theory, molecular spectroscopy, statistical mechanics.

CHEM 3481. Physical Chemistry Laboratory I. 2 Credit Hours.
Laboratory investigations of physical principles applied to chemical systems.

CHEM 3482. Physical Chemistry Laboratory II. 2 Credit Hours.
Laboratory investigations of physical principles applied to chemical systems.

CHEM 3511. Survey of Biochemistry. 3 Credit Hours.
Introductory course in biochemistry dealing with the chemistry and biochemistry of proteins, lipids, carbohydrates, nucleic acids, and other biomolecules. Credit not awarded for both CHEM 3511 and (CHEM 4511 or CHEM 3521).

CHEM 3521. Biochemistry I. 3 Credit Hours.
The chemistry and biochemistry of proteins, lipids, carbohydrates, nucleic acids, and other biomolecules. Credit not awarded for both CHEM 3521 and (CHEM 4511 or CHEM 3511).

CHEM 3522. Biochemistry II. 3 Credit Hours.
The chemistry and biochemistry of proteins, lipids, carbohydrates, nucleic acids, and other biomolecules.

CHEM 3700. The Science of Alternative Energy. 3 Credit Hours.
Scientific principles governing the current and future approaches in solar photo-voltaics, fuel cells, biomass conversion, nuclear energy and wind power.

CHEM 3812. Special Topics. 2 Credit Hours.
Special Topics in Chemistry.

CHEM 3XXX. Chemistry Elective. 1-21 Credit Hours.

CHEM 4113. Applications of Inorganic Chemistry in Current Energy Research. 3 Credit Hours.
The principles of coordination chemistry applied to theories and mechanisms of energy conversion and storage in chemistry and biology. Students cannot receive credit for CHEM 4113 and CHEM 6171.

CHEM 4311. Advanced Organic Chemistry. 3 Credit Hours.
Construction reactions and functional group interconversions as applied to multistep organic synthesis.

CHEM 4341. Applied Spectroscopy. 3 Credit Hours.
Theory and application of NMR, mass spectrometry, and infrared spectroscopy in the determination of organic structures.

CHEM 4401. Molecular Spectroscopy. 3 Credit Hours.
Introduction to the theory and applications of molecular spectroscopy, including electronic, vibrational, rotational transitions, and selections rules.

CHEM 4452. Chemistry of the Solid State. 3 Credit Hours.
Application of the concepts of physical and inorganic chemistry to the structure of solids and their chemical and physical properties.

CHEM 4485. Computational Chemistry. 3 Credit Hours.
Introductory course in computational chemistry discussing electronic structure theory, semi-empirical methods, molecular mechanics, transition-state searching, and computation of thermodynamic quantities.

CHEM 4511. Biochemistry I. 3 Credit Hours.
The chemistry and biochemistry of proteins, lipids, carbohydrates, nucleic acids, and other biomolecules. Credit not awarded for both CHEM 4511 and (CHEM 3511 or CHEM 3521).

CHEM 4512. Biochemistry II. 3 Credit Hours.
The chemistry and biochemistry of proteins, lipids, carbohydrates, nucleic acids, and other biomolecules.

CHEM 4521. Biophysical Chemistry. 3 Credit Hours.
The physical chemistry of biological systems, biological macromolecules, and biological aggregates.

CHEM 4581. Biochemistry Laboratory I. 3 Credit Hours.
Modern biochemical techniques including methods for protein, nucleic acid, and lipid isolation and characterization; enzyme assays; chromatography; electrophoresis; and use of databases.

CHEM 4582. Biochemistry Laboratory II. 3 Credit Hours.
Laboratory techniques in the isolation and characterization of biological molecules with special emphasis on modern techniques.

CHEM 4601. Chemistry Seminar. 2 Credit Hours.
Student presentations of recent research topics in chemistry or biochemistry based on lab experience and/or literature searches.

CHEM 4684. Advanced Chemistry Lab. 4 Credit Hours.
A modular laboratory involving a series of multipart experiments that build upon chemical principles and experimental techniques introduced in earlier courses and instructional laboratories. Credit not allowed for both CHEM 4684 and CHEM 4681.

CHEM 4694. Intern Assistantship (Undergraduate Internship for Pay). 1-21 Credit Hours.
Undergraduate Internship for which the student is paid, Juniors and Seniors only.

CHEM 4695. Undergraduate Internship (Undergraduate Internship for Academic Credit). 1-21 Credit Hours.
Undergraduate Internship for academic credit, Juniors and Seniors only.

CHEM 4696. Teaching Assistantship. 3 Credit Hours.
Chemistry and biochemistry teaching carried out under the guidance of a faculty member. Non-Billable for Pay.

CHEM 4698. Undergraduate Research Assistantship. 1-4 Credit Hours.
Independent research conducted under the guidance of a faculty member.

CHEM 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

CHEM 4740. Atmospheric Chemistry. 3 Credit Hours.
This course provides a general chemical description of the Earth's atmospheric system with a major focus on the two lowest layers of the atmosphere, i.e., the troposphere and the stratosphere. Crosslisted with EAS 4740.

CHEM 4759. Electrochemical Energy Storage and Conversion. 3 Credit Hours.
An elective class for senior-level students interested in electrochemical storage and conversion, including the fundamentals of electrochemistry and practical battery and fuel cells.

CHEM 4760. Biocatalysis and Metabolic Engineering. 3 Credit Hours.
This course provides an in-depth coverage of various topics in biocatalysis and metabolic engineering. Goals of this course are the development of an understanding of proteins as catalysts, their functioning in metabolic networks, their application in various industries, recognition of their potential for addressing future challenges in science and engineering. Crosslisted with CHBE 4760.

CHEM 4762. Protein Engineering. 3 Credit Hours.
This course covers the theory and practice of protein engineering methods, including specific examples of engineered proteins and their applications from the literature.

CHEM 4765. Drug Design, Development, and Delivery. 3 Credit Hours.
Introduction to the pharmaceutical development process, including design of new drugs, synthesis and manufacturing issues, and methods for delivery into the body. Includes student presentations. Crosslisted with CHBE and BMED 4765.

CHEM 4775. Polymer Science and Engineering I: Formation and Properties. 3 Credit Hours.
An introduction to the chemistry, structure, and formation of polymers, physical states and transitions, physical and mechanical properties of polymer fluids and solids. Crosslisted with CHE, ME, MSE, and PTFE 4775.

CHEM 4776. Polymer Science and Engineering II: Analysis, Processing, and Laboratory. 3 Credit Hours.
Polymer fabrication processes and methods of characterization and identification of polymers are presented. Experiments in polymerization, processing, and property evaluation of polymers. Crosslisted with CHE, ME, MSE, and TFE 4776.

CHEM 4785. Nanoscale Science and Technology. 3 Credit Hours.
Chemistry and physics of materials, structures, and surfaces with characteristic feature sizes below 100 nm, and their applications in catalysis, electronics, photonics, energy, and biomedicine.

CHEM 4801. Special Topics. 1 Credit Hour.
Topics of current interest not included in the regular course offerings.

CHEM 4802. Special Topics. 2 Credit Hours.
Topics of current interest not included in the regular course offerings.

CHEM 4803. Special Topics. 3 Credit Hours.
Topics of current interest not included in the regular course offerings.

CHEM 4804. Special Topics. 4 Credit Hours.
Topics of current interest not included in the regular course offerings.

CHEM 4805. Special Topics. 5 Credit Hours.
Topics of current interest not included in the regular course offerings.

CHEM 4901. Special Problems in Chemistry. 1-21 Credit Hours.
Course of individualized instruction, which will include library, conference, and laboratory investigations.

CHEM 4902. Special Problems in Chemistry. 1-21 Credit Hours.
Course of individualized instruction, which will include library, conference, and laboratory investigations.

CHEM 4903. Special Problems in Chemistry. 1-21 Credit Hours.
Course of individualized instruction, which will include library, conference, and laboratory investigations.

CHEM 4XXX. Chemistry Elective. 1-21 Credit Hours.

CHEM 6170. Inorganic Chemistry I. 3 Credit Hours.
A series of key topics in inorganic chemistry will be reviewed: acids/bases, redox processes, bonding and structure, transition metal chemistry, coordination complexes.

CHEM 6171. Inorganic Chemistry II. 3 Credit Hours.
Contemporary topics in inorganic chemistry including bioinorganic chemistry, reaction mechanisms and kinetics, optical and magnetic properties of molecular species, and inorganic materials.

CHEM 6172. Physical Methods in Inorganic Chemistry. 3 Credit Hours.
An introduction to the use of physical methods in inorganic chemistry including vibrational spectroscopy, multinuclear NMR, EST, Mossbauer, magnetometery, NQR, PES, diffraction, and EXAFS.

CHEM 6181. Chemical Crystallography. 3 Credit Hours.
The collection and interpretation of diffraction data. Single crystal structure analysis, powder diffraction for phase identification and quantitative analysis, and Rietveld refinement.

CHEM 6182. Chemistry of the Solid State. 3 Credit Hours.
An introduction to the chemistry of the solid state. Synthetic methods, measurement of properties, structure of solids, theory of electrical, optical, and magnetic properties.

CHEM 6183. Organometallic Chemistry. 3 Credit Hours.
The chemistry of main group and transition metal organometallics. Including synthetic methods, homogeneous catalysis and catalytic cycles, and synthetically useful organometallic reagents.

CHEM 6271. Analytical Chemistry I. 3 Credit Hours.
Discussion of chemical equilibrium, separations, and bioanalytical methods.

CHEM 6272. Analytical Chemistry II. 3 Credit Hours.
Topics include experimental design, electronics, and spectroscopy.

CHEM 6273. Analytical techniques for chemistry and biology. 3 Credit Hours.
An introduction to analytical techniques used to answer biological questions with a focus on the roles of small molecules from the human and environmental microbiome.

CHEM 6281. Mass Spectrometry. 3 Credit Hours.
Topics include sample handling, ionization methods, MS/MS, and quantitative analysis.

CHEM 6282. Chemical Sensors. 3 Credit Hours.
Origins of selectivity, principles of transduction mechanisms, construction and applications of modern chemical sensors.

CHEM 6283. Electroanalytical Chemistry. 3 Credit Hours.
Coulometry, electrolytic separations, polargraphy chronopotentimetry, coulometric titrations, voltammetry, and hydrodynamic electrochemical methods of analysis.

CHEM 6284. Environmental Analytical Chemistry. 3 Credit Hours.
Application of techniques from analytical chemistry in monitoring the environment.

CHEM 6285. Analytical Spectroscopy. 3 Credit Hours.
Modern analytical spectroscopy and use of analytical techniques in chemistry and chemical engineering.

CHEM 6287. Scanned Probe Techniques. 3 Credit Hours.
An in-depth analysis of the theory, practice and application of scanning probe microscopy techniques.

CHEM 6288. Analytical Separations. 3 Credit Hours.
In-depth understanding of separation processes and the mechanisms underlying the design and development of modern separation techniques.

CHEM 6370. Organic Reaction Mechanisms. 3 Credit Hours.
Reaction mechanisms in organic chemistry, including the concepts of physical organic chemistry, reactive intermediates, and complex functional group transformations.

CHEM 6371. Identification of Organic Compounds. 3 Credit Hours.
Description of molecular structure and identification of organic compounds using spectroscopic techniques.

CHEM 6372. Physical Organic Chemistry. 3 Credit Hours.
Physical methods in organic chemistry; determination of reaction pathways.

CHEM 6373. Organic Synthesis. 3 Credit Hours.
Methods and strategy for the preparation of complex organic compounds.

CHEM 6381. Advanced Organic Synthesis. 3 Credit Hours.
Advanced topics in the synthesis of complex organic molecules.

CHEM 6382. Computational Methods in Organic Chemistry and Biochemistry. 3 Credit Hours.
The development of approximate methods in molecular orbital theory and molecular mechanics and their application to problems in organic and biochemistry.

CHEM 6471. Chemical Thermodynamics and Kinetics. 3 Credit Hours.
Laws of classical thermodynamics and their chemical applications. Introduction to statistical mechanics and chemical kinetics.

CHEM 6472. Quantum Chemistry and Molecular Spectroscopy. 3 Credit Hours.
Introduction to quantum mechanics and its application to molecular systems, atomic and molecular spectroscopy.

CHEM 6481. Statistical Mechanics. 3 Credit Hours.
Statistical thermodynamics, lattice statistics, molecular distribution and correlation functions, the theories of liquids and solutions, phase transitions, cluster theory, and measurement.

CHEM 6482. Chemical Kinetics and Reaction Dynamics. 3 Credit Hours.
Modern theoretical and experimental methods for studying macroscopic and microscopic bimolecular and unimolecular processes are discussed, as are methods for describing complex kinetic systems.

CHEM 6483. Chemistry of Electronic Organic Materials. 3 Credit Hours.
This course provides a broad description of the basic chemical and physical concepts that determine the properties of electrically active materials.

CHEM 6484. Chemistry of Optical Organic Materials. 3 Credit Hours.
Course description includes synthesis, electronic structure, physico-chemical characterization, and device applications of optically active organic materials.

CHEM 6485. Computational Chemistry. 3 Credit Hours.
Introductory course in computational chemistry, discussing electronic structure theory, semiemphirical methods, molecular mechanics, transistion-state searching, and computation of thermodynamic quantities.

CHEM 6491. Quantum Mechanics. 3 Credit Hours.
Important concepts and applications of quantum mechanics at the intermediate level, including operators, perturbation and variational methods applied to atoms and molecules.

CHEM 6492. Molecular Spectroscopy. 3 Credit Hours.
Study of energy of electronic transitions in molecules, selection rules, excitation processes, and laser spectroscopy.

CHEM 6501. Biochemistry I. 3 Credit Hours.
The chemistry and biochemistry of proteins, lipids, carbohydrates, nucleic acids, and other biomolecules.

CHEM 6502. Biochemistry II. 3 Credit Hours.
The chemistry and biochemistry of proteins, lipids, carbohydrates, nucleic acids, and other biomolecules.

CHEM 6571. Enzymology and Metabolism. 3 Credit Hours.
Structure and chemistry of enzymes, enzyme mechanism, enzyme kinetics, enzyme inhibitors, and medicinal chemistry.

CHEM 6572. Macromolecular Structure. 3 Credit Hours.
Principles of protein, nucleic acid, and membrane structure. Major emphasis on protein folding, detailed description of three-dimensional structure of proteins and nucleic acids.

CHEM 6573. Molecular Biochemistry. 3 Credit Hours.
Current topics in molecular biology including eukaryotic transcriptions, RNA processing, repair and recombination, immunity, viruses, DNA fingerprinting, and genome sequencing.

CHEM 6581. Protein Crystallography. 3 Credit Hours.
Application of crystallographic principles to the structure determination of macromolecules by molecular replacement, multiple isomorphous replacements. High-speed data collection methods and cryocrystallography.

CHEM 6582. Biophysical Chemistry. 3 Credit Hours.
Applications of the principles and techniques of physical chemistry in biochemistry, with emphasis in the equilibrium and dynamic behavior of macromolecules in solution.

CHEM 6583. Drug Design and Discovery. 3 Credit Hours.
Application of principles of chemistry and biology to the creation of knowledge leading to the introduction of new therapeutic agents.

CHEM 6584. Contemporary Biochemistry. 3 Credit Hours.
Topics vary from year to year, but will include subjects from the biochemical literature, such as in Journal of Biological Chemistry.

CHEM 6750. Preparation and Reaction of Polymers. 3 Credit Hours.
A detailed treatment of the reactions involved in the synthesis of both human-made and natural polymers, including preparation and degradative reactions of polymer systems. Crosslisted with CHE and PTFE 6750.

CHEM 6751. Physical Chemistry of Polymer Solutions. 3 Credit Hours.
Study of polymer solutions, polymer miscibility, absorptions, sorptions, plasticization, molecular weights, molecular weight distributions, and interfacial phenomena using thermodynamics and statistical mechanics. Crosslisted with CHE, MSE, and PTFE 6751.

CHEM 6752. Polymer Characterization. 4 Credit Hours.
This course introduces the student to surface, near-surface, and structural methods of polymer characterization. Specialized techniques critical to physical structure are emphasized. Crosslisted with CHE, MSE, and PTFE 6752.

CHEM 6755. Theoretical Chemistry of Polymers. 3 Credit Hours.
Thermodynamics and microscopic dynamics of polymers. Fundamental concepts, including scaling concepts, governing anisotropy of polarizability, phase transitions, morphology, time-dependent correlations, etc. are discussed. Crosslisted with MSE and PTFE 6755.

CHEM 6756. Discovery of Signaling Molecules. 3 Credit Hours.
The diversity of chemical signals between organisms and their structural specificities will be presented along with chemical and biological methods for isolating signaling molecules. Crosslisted with BIOL 6756 and CEE 6756.

CHEM 6757. Advanced Polymer Chemistry. 3 Credit Hours.
Advanced topics in synthetic polymerization methodology, polymer structure, and polymer properties in solution and the solid state.

CHEM 6760. Biocatalysis and Metabolic Engineering. 3 Credit Hours.
This course provides in-depth coverage of various topics in biocatalysis and metabolic engineering. Goals of this course are the development of an understanding of proteins as catalysts, their functioning in metabolic networks, their application in various industries, and recognition of their potential for addressing future challenges in science and engineering. Crosslisted with CHBE 6760.

CHEM 6762. Protein Engineering. 3 Credit Hours.
This course covers the theory and practice of protein engineering methods, including specific examples of engineered proteins and their applications from the literature.

CHEM 6765. Drug Design, Development and Delivery. 3 Credit Hours.
Introduction to the pharmaceutical development process, including design of new drugs, synthesis and manufacturing issues, and methods of delivery into the body. Includes student presentations. Crosslisted with BMED 6765 and CHBE 6765.

CHEM 6785. Nanoscale Science and Technology. 3 Credit Hours.
Chemistry and physics of materials, structures, and surfaces with characteristic feature sizes below 100 nm, and their applications in catalysis, electronics, photonics, energy, and biomedicine.

CHEM 6XXX. Chemistry Elective. 1-21 Credit Hours.

CHEM 7000. Master's Thesis. 1-21 Credit Hours.

CHEM 7001. Introduction to Research. 3 Credit Hours.
Introduction to laboratory techniques, experimental design, library and database searching, presentations.

CHEM 8000. Seminar in Chemistry. 1 Credit Hour.

CHEM 8001. Faculty Seminar. 1-3 Credit Hours.

CHEM 8002. Information Resources for Chemists and Biochemists. 2 Credit Hours.

CHEM 8003. Student Seminar. 1-3 Credit Hours.

CHEM 8801. Special Topics. 1 Credit Hour.
Special Topics.

CHEM 8802. Special Topics. 2 Credit Hours.

CHEM 8803. Special Topics. 3 Credit Hours.

CHEM 8812. Special Topics. 2 Credit Hours.

CHEM 8813. Special Topics in Inorganic Chemistry. 3 Credit Hours.
Topics from the inorganic chemistry research literature.

CHEM 8823. Special Topics in Analytical Chemistry. 3 Credit Hours.
Topics from the analytical chemistry research literature.

CHEM 8831. Special Topics. 1 Credit Hour.

CHEM 8833. Special Topics in Organic Chemistry. 3 Credit Hours.
Topics from the organic chemistry research literature.

CHEM 8843. Special Topics in Physical Chemistry. 3 Credit Hours.
Topics from the physical chemistry research literature.

CHEM 8853. Special Topics in Biochemistry. 3 Credit Hours.
Topics from the biochemistry research literature.

CHEM 8863. Special Topics. 3 Credit Hours.
Topics from the polymer chemistry research literature.

CHEM 8873. Special Topics in Polymer Chemistry. 3 Credit Hours.
Topics from the polymer chemistry research literature.

CHEM 88X2. Xfer-Spec Top-Org Chem. 2 Credit Hours.

CHEM 8901. Special Problems. 1-21 Credit Hours.

CHEM 8902. Special Problems. 1-21 Credit Hours.

CHEM 8903. Special Problems. 1-21 Credit Hours.

CHEM 8997. Teaching Assistantship. 1-9 Credit Hours.
For graduate students holding graduate teaching assistantships.

CHEM 8998. Research Assistantship. 1-9 Credit Hours.
For graduate students holding graduate research assistantships.

CHEM 9000. Doctoral Thesis. 1-21 Credit Hours.

Chinese (CHIN)

CHIN 1001. Elementary Chinese I. 4 Credit Hours.
Performance-based training in pronunciation, tones, and sentence structure, developing a baseline for listening, speaking, reading, and writing Chinese, as well as fostering a sensitivity to Chinese culture. Humanities credit awarded for CHIN 1001 upon successful completion of CHIN 1002 or CHIN 2001.

CHIN 1002. Elementary Chinese II. 4 Credit Hours.
Continued performance-based training in phonetics, grammar, sentence structure, and characters, focusing on the similarities and differences between English and Chinese.

CHIN 1011. Accelerated Elementary Chinese I. 4 Credit Hours.
This is the first of two courses in the basic Chinese sequence geared for heritage learners at the elementary level. The pace is approximately 30% faster than the non-accelerated course.

CHIN 1012. Accelerated Elementary Chinese II. 4 Credit Hours.
This is the second of two courses in the basic Chinese sequence geared for heritage learners at the elementary level. The pace is approximately 30% faster than the non-accelerated course.

CHIN 10X1. Trans Elementary Chinese I. 3 Credit Hours.

CHIN 10X2. Trans Elementary Chinese II. 3 Credit Hours.

CHIN 1501. Chinese for Heritage Learners I. 3 Credit Hours.
For heritage students in the U.S. who have never studied Chinese formally, but who speak some Chinese without being able to read or write it. Taught in Chinese.

CHIN 1813. Special Topics. 3 Credit Hours.
Topics of current interest in Chinese.

CHIN 1814. Special Topics. 4 Credit Hours.
Topics of current interest in Chinese.

CHIN 1XXX. Chinese Elective. 1-21 Credit Hours.

CHIN 2001. Intermediate Chinese I. 3 Credit Hours.
Reinforcing basic language skills and knowledge to enhance students' communication ability including oral dialogue and written correspondence in current Chinese society.

CHIN 2002. Intermediate Chinese II. 3 Credit Hours.
Continued reinforcement of basic language skills and knowledge to enhance students' communication ability including oral dialogue and written correspondence in current Chinese society.

CHIN 2011. Accelerated Intermediate Chinese I. 3 Credit Hours.
This is the first of two courses at the intermediate level in the Chinese sequence geared for heritage learners. The pace is approximately 30% faster than the non-accelerated course.

CHIN 2012. Accelerated Intermediate Chinese II. 3 Credit Hours.
This is the second of two courses at the intermediate level in the Chinese sequence geared for heritage learners. The pace is approximately 30% faster than the non-accelerated course.

CHIN 2501. Chinese For Heritage Learners II. 3 Credit Hours.
For intermediate-level heritage students in the U.S. who can communicate some in Chinese, but cannot read or write it for academic purposes. Taught in Chinese.

CHIN 2694. Internship Assistantship. 1-21 Credit Hours.
Modern Language Undergraduate Internship for pay for freshmen and sophomores, by permit only. The internship experience must be at a unit or agency approved by the School of Modern Language.

CHIN 2695. Undergraduate Internship. 1-21 Credit Hours.
Modern Language Undergraduate Internship for credit for freshmen and sophomores, by permit only. The internship experience must be at a unit or agency approved by the School of Modern Languages.

CHIN 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

CHIN 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

CHIN 2813. Special Topics. 3 Credit Hours.
Topics of current interest in Chinese.

CHIN 2XXX. Chinese Elective. 1-21 Credit Hours.

CHIN 3003. Intermediate Chinese III. 3 Credit Hours.
Continued reinforcement of basic speaking, reading, and writing skills, and cultural knowledge to enhance students' communication ability in topics relating to contemporary life and Chinese society.

CHIN 3004. Advanced Chinese I. 3 Credit Hours.
Continued reinforcement of intermediate speaking, reading, and writing skills, and cultural knowledge to enhance students' communication ability in topics relating to contemporary life and Chinese society.

CHIN 3021. Chinese Society and Culture I. 3 Credit Hours.
Comprehension and discussion of issues in contemporary Chinese culture.

CHIN 3022. Chinese Society and Culture II. 3 Credit Hours.
Comprehension and discussion of Chinese news, economic reports, political events, feature stories, and sports on television and in newspapers.

CHIN 3400. China: A Cultural Odyssey. 3 Credit Hours.
Key aspects of culture and highlights of Chinese civilization: philosophy, arts and architecture, belief systems, family relationships, historical periods, social changes, technological innovation. Taught in English.

CHIN 3401. A Kaleidoscope of Chinese Language. 3 Credit Hours.
Explores the Chinese language from multiple perspectives, examining its multifaceted and intriguing interactions with society, culture, gender, music, politics, and media. Taught in English.

CHIN 3691. Chinese for Current Events. 3 Credit Hours.
Reading, discussion and analysis of intermediate/advanced current events texts and authentic media. Part of the intensive summer Chinese language program (LBAT). Admission by application only.

CHIN 3692. Business Chinese. 3 Credit Hours.
Acquisition of business technology, protocols, decorum strategies and improvement of oral communication skills. Reading and writing of notes, correspondence, and reports. Part of the summer language program (LBAT). Admission by application only.

CHIN 3693. Conversation Practicum (LBAT). 3 Credit Hours.
Language practicum in the local community with written and oral classroom presentations. Part of the intensive summer Chinese language program (LBAT). Admission by application only.

CHIN 3696. Economic Development and Sustainability in China. 3 Credit Hours.
Examines the world's most populous nation's assault on its environment and resources in the pursuit of rapid economic growth. Taught in Chinese.

CHIN 3813. Special Topics. 3 Credit Hours.
Permits a group of students and a professor to pursue areas of the Chinese language not extensively treated in other courses in the department.

CHIN 3821. Special Topics. 1 Credit Hour.
Topics of current interest in Chinese.

CHIN 3822. Special Topics. 2 Credit Hours.
Topics of current interest in Chinese.

CHIN 3823. Special Topics. 3 Credit Hours.
Topics of current interest in Chinese.

CHIN 3833. Special Topics. 3 Credit Hours.
Topics of current interest in Chinese.

CHIN 3XXX. Chinese Elective. 1-21 Credit Hours.

CHIN 4003. Advanced Chinese II: Contemporary China. 3 Credit Hours.
Development of advanced communication abilities. Materials deal with the economic, cultural, social, and political changes in contemporary China. Taught in Chinese.

CHIN 4004. Advanced Chinese III: Contemporary China. 3 Credit Hours.
Further development of advanced communication abilities. Materials deal with the economic, cultural, social, and political changes in contemporary China. Taught in Chinese.

CHIN 4005. Advanced Chinese Grammar. 3 Credit Hours.
This course will build on students' command of Chinese grammatical structures to enhance their spoken and written performances in academic setting. Taught in Chinese.

CHIN 4021. Advanced Language, Popular Music and Culture. 3 Credit Hours.
Utilizing popular songs/videos as cultural texts, this advanced language and culture course develops the students' listening, reading, writing, presentation, and web-based research in Chinese.

CHIN 4022. Kungfu Fiction/Pop Cul. 3 Credit Hours.
Utilizing authentic kungfu fiction texts, this advanced language and culture course develops students' listening, reading, writing, presentation, and web-based research, all in Chinese.

CHIN 4023. Chinese Strategy & The Art of War. 3 Credit Hours.
Using classical texts and their modern Chinese translations, this advanced language course analyzes Chinese strategic language and thought, with Western cultural comparison. Taught in Chinese.

CHIN 4031. Chinese-Language Cinema: Technological, Cultural, and Urban Transformation in China. 3 Credit Hours.
Utilizing selected Chinese films as texts, this advanced Chinese course analyzes and discusses the technological, cultural, and urban transformation in China.

CHIN 4032. Kungfu and Wuxia Film and Pop Culture. 3 Credit Hours.
Utilizing authentic film texts, this advanced language/culture course develops the students; listening, reading, writing, presentation, and web-based research abilities and skills in Chinese.

CHIN 4035. A Documentary Survey of Sino-American Interactions. 3 Credit Hours.
This course seeks to foster students' understanding of how Sino-U.S. interactions over history have shaped the perspectives of the other culture. Taught in Chinese.

CHIN 4500. Advanced Intercultural Seminar. 3 Credit Hours.
Integrates cross-cultural research and reflection into discussion of current issues in the Chinese-speaking world. Intended for students who have had some study-abroad experience in China. Conducted in Chinese.

CHIN 4694. Internship Assistantship. 1-21 Credit Hours.
Modern Language Undergraduate Internship for pay for junior and seniors, by permit only. The internship experience must be at a unit or agency approved by the School of Modern Languages.

CHIN 4695. Chinese Internship. 1-3 Credit Hours.
Professional experience with a business/organization in which students enhance their language skills and cultural knowledge in Chinese in relation to the practical goals/objectives of the entity.

CHIN 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

CHIN 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

CHIN 4813. Special Topics. 3 Credit Hours.
Topics of interest not covered in the regular course offerings.

CHIN 4823. Special Topics. 3 Credit Hours.
Topics of current interest in Chinese.

CHIN 4833. Special Topics. 3 Credit Hours.
Topics of current interest in Chinese.

CHIN 4901. Special Problems in Chinese. 1-21 Credit Hours.
Provides special instruction according to special needs.

CHIN 4902. Special Problems in Chinese. 1-21 Credit Hours.
Provides special instruction according to special needs.

CHIN 4XXX. Chinese Elective. 1-21 Credit Hours.

CHIN 6003. Contemporary China I. 3 Credit Hours.
Development of advanced communication abilities. Materials deal with the economic, cultural, social, and political changes in contemporary China. Taught in Chinese. The first in the sequence.

CHIN 6021. Chinese Popular Culture. 3 Credit Hours.
Utilizing popular songs/videos as cultural texts, this advanced language and culture course develops the students' listening, reading, writing, presentation, and web-based research in Chinese.

CHIN 6022. Martial Arts Fiction. 3 Credit Hours.
Utilizing authentic martial arts fiction texts, this advanced language and culture course develops the students' listening, reading, writing, presentation, and web-based research in Chinese.

CHIN 6023. Art of War and Thirty-Six Stratagems. 3 Credit Hours.
This advanced Chinese language and culture course analyzes traditional & modern Chinese culture via Sunzi Art of War and The Thirty-Six Stratagems. Taught in Chinese.

CHIN 6031. Chinese Cinema and Media. 3 Credit Hours.
Chinese films and media serve as authentic texts to enhance students' language-learning skills and knowledge in Chinese culture, philosophy, history, and society. Taught in Chinese.

CHIN 6032. Kungfu and Wuxia Film and Pop Culture. 3 Credit Hours.
Utilizing authentic film texts, this advanced language/culture course develops the students' listening, reading, writing, presentation, and web-based research abilities and skills in Chinese.

CHIN 6252. Chinese Domestic Internship. 1-3 Credit Hours.
Students complete domestic internships. Conducted in Chinese. Online course.

CHIN 6500. Intercultural Seminar. 3 Credit Hours.
Integrates cross-cultural research and reflection into discussion of current issues in China. Taught in Chinese.

CHIN 6503. Professional Portfolio Development. 3 Credit Hours.
Preparation of a professional portfolio connecting experiences and coursework in the MS program towards career preparation. Conducted in Chinese.

CHIN 6510. Applied Language Practicum. 3 Credit Hours.
Students will serve as researchers, student aides and apprentice instructors for any 3/4000-level undergraduate course approved by their adviser and the course.

CHIN 6511. Applied Language Practicum Abroad. 3 Credit Hours.
Students serve as researchers and apprentice instructors in the LBAT or other faculty-led overseas language immersion program of the School of Modern Languages.

CHIN 6695. Chinese Internship Abroad. 1-3 Credit Hours.
Students complete internships abroad in China. Conducted in Chinese. Online course.

CHIN 6696. Chinese Internship Abroad. 1-6 Credit Hours.
Students complete internships abroad in a Spanish-speaking country. Conducted in Spanish. Online course. 6 credits.

CHIN 6998. Master's Project. 1-6 Credit Hours.
Optional project course taught in Chinese.

CHIN 7000. Master's Thesis. 1-6 Credit Hours.
Optional thesis course.

CHIN 8803. Special Topics. 3 Credit Hours.
Topics of current interest not covered in the regular course offerings.

CHIN 8804. Special Topics. 4 Credit Hours.
Special Topics in Chinese.

CHIN 8901. Special Problems in Chinese. 1-21 Credit Hours.
Provides the special instruction required under special programs.

CHIN 8902. Special Problems in Chinese. 1-21 Credit Hours.
Provides the special instruction required under special programs.

CHIN 8903. Special Problems in Chinese. 1-21 Credit Hours.
Provides the special instruction required under special programs.

College of Architecture (COA)

COA 1011. Fundamentals of Design and the Built Environment I. 3 Credit Hours.
Introduction to creative problem-solving and the design realization cycle through project-based design exercises that emphasize the role of representation.

COA 1012. Fundamentals of Design and the Built Environment II. 4 Credit Hours.
Introduction to the design of complex problems through an emphasis on integrative and collaborative design strategies, research, critical reflection, and interdisciplinary team work.

COA 1060. Introduction to Design and the Built Environment. 3 Credit Hours.
Introduction to architecture, building construction, and industrial design through case studies that illuminate past and present practices, as well as future possibilities within the disciplines.

COA 2241. History of Art I. 3 Credit Hours.
A survey of artistic manifestations from primitive times to the present. First semester sequence, prehistoric through Renaissance; second semester, Renaissance through contemporary art.

COA 2242. History of Art II. 3 Credit Hours.
A survey of artistic manifestations from primitive times to the present. First semester sequence, prehistoric through Renaissance; second semester Renaissance through contemporary art.

COA 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

COA 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

COA 3114. Art and Architecture in Classical Greece. 3 Credit Hours.
An intensive on-site investigation of the role that the arts and architecture have played in the development of classical Greek civilization.

COA 3115. Art and Architecture in Italy I. 3 Credit Hours.
Investigations of the painting, sculpture, and architecture of the Classical, Early Christian, Byzantine, and Medieval periods in Italy with special emphasis on Rome.

COA 3116. Art and Architecture in Italy II. 3 Credit Hours.
Investigations of the painting, sculpture, and architecture of the Renaissance and Baroque periods in Italy with special emphasis on the works of Rome.

COA 4000. Furniture Workshop: Material Potential and Fabrication Strategies. 3 Credit Hours.
The course investigates construction into the design cycle to explore the boundaries between furniture, architecture, and sculpture. Exercises introduce furniture production techniques, material properties, and CNC milling.

COA 4010. History of Construction Industry. 3 Credit Hours.
Addresses how today's construction industry is organized and its particular characteristics, how it evolved from early times and where it may be heading in the future.

COA 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

COA 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

COA 4801. Special Topics. 1 Credit Hour.
Topics in design and the built environment.

COA 4802. Special Topics. 2 Credit Hours.
Topics in design and the built environment.

COA 4803. Special Topics. 3 Credit Hours.
Topics in design and the built environment.

COA 4804. Special Topics. 4 Credit Hours.
Topics in design and the built environment.

COA 4805. Special Topics. 5 Credit Hours.
Topics in design and the built environment.

COA 6010. History of Construction Industry. 3 Credit Hours.
Addresses how today's construction industry is organized and its particular characteristics, how it evolved from early times and where it may be heading in the future.

COA 6011. Urban Design Laboratory. 6 Credit Hours.
Urban design laboratory problems focusing on analysis, design, and implementation strategies for contemporary urban problems.

COA 6114. Art and Architecture in Classical Greece. 3 Credit Hours.
An intensive on-site investigation of the role that the arts and architecture have played in the development of classical Greek civilization.

COA 6115. Art and Architecture in Italy I. 3 Credit Hours.
Investigations of the painting, sculpture, and architecture of the Classical, Early Christian, Byzantine, and Medieval periods in Italy with special emphasis on Rome.

COA 6116. Art and Architecture in Italy II. 3 Credit Hours.
Investigations of the painting, sculpture, and architecture of the Renaissance and Baroque periods in Italy with special emphasis on the works of Rome.

COA 6120. Retrofitting the Suburbia. 3 Credit Hours.
Study of suburban redevelopment trends, projects, and policies that improve environmental, social, and economic sustainability, with an emphasis on urban design strategies.

COA 6151. History of Urban Form. 3 Credit Hours.
History of the city as a collective work of architecture with an emphasis on the city's physical form and space. Credit not allowed for both COA 6151 and ARCH 4151.

COA 6763. Design of Design Environments. 3 Credit Hours.
Analysis of design processes; analysis of current design tools at both the user interface and functional levels; procedures for developing better design tools. Credit not allowed for both COA 6763 and ID 6763 or CS 6763.

COA 6764. Geometric Modeling. 3 Credit Hours.
Software development course focusing on 3D geometric constructions and modeling; emphasizes solid modeling and its role in design. Crosslisted with CS 6764.

COA 7011. Urban Design Studio I. 6 Credit Hours.
Advanced urban design problems emphasizing the application of contemporary urban design research and multidisciplinary collaboration into the design process.

COA 7012. Urban Design Studio II. 6 Credit Hours.
Advanced urban design problems emphasizing the application of contemporary urban design research and multidisciplinary collaboration into the design process.

COA 8000. Doctoral Seminar. 1 Credit Hour.

COA 8530. PhD Planning Seminar. 1 Credit Hour.
Discussion of research and pedagogy topics and methodologies for city and regional planning.

COA 8600. The Genesis of Architecture. 3 Credit Hours.
The nature of architecture illustrated from those of all cultures; determinist theories; its social values and its meanings to the individual-material, physical, anthropological, and cognitive.

COA 8610. Thought and Interpretation in Architecture from the Hellenic Period to the 1830's. 3 Credit Hours.
A survey of architectural thought and theory taking account of other fields; paralleled by a review of major critical texts and assessments to the present day.

COA 8612. Thought and Interpretation in Architecture from the 1830's to the Twentieth Century. 3 Credit Hours.
A survey of architectural thoughts and theory taking account other fields; paralleled by a review of major critical texts and assessments to the present day.

COA 8620. The Design and Evolution of American Space. 3 Credit Hours.
Topical seminar on the development of urban, suburban, and rural American spatial forms, with emphasis on the relationship between public order and vernacular settlement.

COA 8625. Theories of Inquiry in Architecture. 3 Credit Hours.
Introduction to research paradigms and their assumptions. The formulation of questions and frameworks of description, representation, analysis, interpretation, and data control.

COA 8630. Theories of Architecture, Space and Culture. 3 Credit Hours.
Accounts of the social functions of architectural space and associated design choices, across a variety of building types and scales of environmental design. Credit will not be awarded for both COA 8630 and ARCH 4630.

COA 8635. Architecture and Policy: Linking Theory and Practice. 3 Credit Hours.
Methods and theories of planning, design, facilities management, and evaluation as they relate to organizational policy and development.

COA 8640. Theories of Psychology for Architecture. 3 Credit Hours.
An examination of social and psychological theory as it is applied to the creation and use of space.

COA 8645. Analytical Models of Built Space and Its Functions. 3 Credit Hours.
Introduction to analytical ideas and methodologies for the quantitative description of built space, form, building use, and functions. Layouts as configurations: boundaries, accessibility, visibility, extensions.

COA 8650. Formal Descriptions of Designs: Analyses of Space, Shape, and Form. 3 Credit Hours.
Introduction to the form and computational description of designs, with an emphasis on spatial patterns. Geometrical constructions, combinatorial approaches, analyses of shape.

COA 8672. Research Seminar in Design Computation. 3 Credit Hours.
Seminar review of developments in computing applied to architecture; current major research issues.

COA 8674. Structuring Multimedia Design Knowledge. 3 Credit Hours.
Theories and tools for structuring multimedia knowledge for design and designers.

COA 8676. Design and Engineering Databases. 3 Credit Hours.
Survey of database use in design and engineering; surveys relational, object-oriented database technology, and ISO-STEP methods of integration.

COA 8680. Performance Aspects of Building Systems Design. 3 Credit Hours.
Engineering analysis of building (sub) systems based on a performance ontology. Criteria, metrics, and tools for performance aspect evaluations in different building technology domains.

COA 8685. Computational Building Simulation. 3 Credit Hours.
Numerical simulation of performance characteristics of whole buildings. Review of the finite element method for uniform treatment of transport phenomena in different building technology domains.

COA 8690. Integrated Design and Engineering Environments for Buildings. 3 Credit Hours.
Surveys of issues for effective integration of heterogeneous design tools for building; previous efforts, current approaches; advanced techniques, including ISO-STEP and IAI.

COA 8811. Special Topics in Architectural/Planning Studies. 1 Credit Hour.

COA 8812. Special Topics in Architectural/Planning Studies. 2 Credit Hours.

COA 8813. Special Topics in Architectural/Planning Studies. 3 Credit Hours.

COA 8821. Special Topics in Architecture and Behavior. 1 Credit Hour.

COA 8822. Special Topics in Architecture and Behavior. 2 Credit Hours.

COA 8823. Special Topics in Architecture and Behavior. 3 Credit Hours.

COA 8831. Special Topics in Design and Technology. 1 Credit Hour.

COA 8832. Special Topics in Design and Technology. 2 Credit Hours.

COA 8833. Special Topics in Design and Technology. 3 Credit Hours.

COA 8841. Special Topics in Design Computing. 1 Credit Hour.

COA 8842. Special Topics in Design Computing. 2 Credit Hours.

COA 8843. Special Topics in Design Computing. 3 Credit Hours.

COA 8851. Special Topics in History and Theory. 1 Credit Hour.

COA 8852. Special Topics in History and Theory. 2 Credit Hours.

COA 8853. Special Topics in History and Theory. 3 Credit Hours.

COA 8861. Special Topics in History and Theory. 1 Credit Hour.

COA 8862. Special Topics in History and Theory. 2 Credit Hours.

COA 8863. Special Topics in History and Theory. 3 Credit Hours.

COA 8871. Special Topics: Urban Design. 1 Credit Hour.

COA 8872. Special Topics: Urban Design. 2 Credit Hours.

COA 8873. Special Topics: Urban Design. 3 Credit Hours.

COA 8874. Special Topics: Urban Design. 4 Credit Hours.

COA 8875. Special Topics: Urban Design. 5 Credit Hours.

COA 8876. Special Topics: Urban Design. 6 Credit Hours.

COA 8901. Special Problems. 1-21 Credit Hours.

COA 8902. Special Problems. 1-21 Credit Hours.

COA 8903. Special Problems. 1-21 Credit Hours.

COA 8904. Special Problems. 1-21 Credit Hours.

COA 8996. Qualifying Paper. 1-21 Credit Hours.

COA 8997. Teaching Assistantship. 1-9 Credit Hours.
For students holding a graduate teaching assistantship.

COA 8998. Research Assistantship. 1-9 Credit Hours.
For students holding a graduate research assistantship.

COA 8999. Preparation for Doctoral Dissertation. 1-21 Credit Hours.

COA 9000. Doctoral Thesis. 1-21 Credit Hours.

College of Engineering (COE)

COE 1000. Freshman Engineering Seminar. 1 Credit Hour.
An introduction to the engineering profession featuring presentations about the undergraduate degree programs at Georgia Tech with a focus on career options.

COE 2001. Statics. 2 Credit Hours.
Elements of statics in two and three dimensions, free-body diagrams, distributed loads, centroids, and friction.

COE 2701. Startup Lab: Introduction to Technology Ventures. 3 Credit Hours.
Elements of technology venture creation including opportunity identification and validation, ideation, customer discovery, market analysis, minimum viable product development, business models, intellectual property, and capital raises.

COE 2801. Special Topics. 1 Credit Hour.
Special Topics.

COE 3001. Mechanics of Deformable Bodies. 3 Credit Hours.
Stress and strain analysis applied to beams, vessels, pipes, and combined loading; stress and strain transformations; beam deflection; column buckling.

COE 3002. Intro to Microelectronics and Nanotechnology Revolution. 3 Credit Hours.
Introduction to microelectronics and nanotechnology: the communications revolution, Moore's law, semiconductors, transistors, MEMS, photonics, analylsis of common technological objects, global impact on technology and society.

COE 3803. Special Topics. 3 Credit Hours.

COE 4803. Special Topics. 3 Credit Hours.

COE 8803. Special Topics. 3 Credit Hours.

Cooperative Work Assignment (COOP)

COOP 2000. Co-op Work Assignment. 12 Credit Hours.

COOP 2001. Spring Term CO-OP Work Assignment. 12 Credit Hours.

COOP 2005. Summer Term CO-OP Work Assignment. 12 Credit Hours.

COOP 2008. Fall Term CO-OP Work Assignment. 12 Credit Hours.

COOP 3011. International Co-op Work Assignment. 12 Credit Hours.
Undergraduate Co-op students working outside the United States.

COOP 3015. Modern Language International Co-op. 12 Credit Hours.

COOP 3018. Modern Language International Co-op. 12 Credit Hours.

COOP 3020. Building Construction Co-op Work Assignment. 6 Credit Hours.
For undergraduate Co-op students majoring in Building Construction.

COOP 3021. Spring Term Building Construction Co-op. 6 Credit Hours.
Spring Term work term for Building Construction majors.

COOP 3028. Fall Term Building Construction Co-op. 6 Credit Hours.
Fall Term work term for Building Construction majors.

COOP 4000. Co-op Work Assignment. 12 Credit Hours.
Co-op Work Assignment For students on Co-op work assignment.

COOP 4001. Spring Term CO-OP Work Assignment. 12 Credit Hours.

COOP 4005. Summer Term CO-OP Work Assignment. 12 Credit Hours.

COOP 4008. Fall Term CO-OP Work Assignment. 12 Credit Hours.

COOP 6003. Co-op Work Assignment. 3 Credit Hours.
For students on Co-op work assignment.

COOP 6006. Co-op Work Assignment. 6 Credit Hours.
For students on Co-op work assignment.

COOP 6009. Co-op Work Assignment. 9 Credit Hours.
For students on Co-op work assignment.

COOP 6012. Co-op Work Assignment. 12 Credit Hours.
For students on Co-op work assignment.

College of Sciences (COS)

COS 1801. Special Topics. 1 Credit Hour.
Special topics.

COS 1802. Special Topics. 2 Credit Hours.
Special Topics.

COS 1803. Special Topics. 3 Credit Hours.
Special Topics.

COS 2000. Introduction to Research. 1 Credit Hour.
Students will learn ethical guidelines for conducting research, develop skills in reading and writing research articles, and explore careers in research.

COS 2801. Special Topics. 1 Credit Hour.
Special Topics.

COS 2802. Special Topics. 2 Credit Hours.
Special Topics.

COS 2803. Special Topics. 3 Credit Hours.
Special Topics.

COS 3801. Special Topics. 1 Credit Hour.
Special Topics.

COS 3802. Special Topics. 2 Credit Hours.
Special Topics.

COS 3803. Special Topics. 3 Credit Hours.
Special Topics.

COS 4801. Special Topics. 1 Credit Hour.
Special Topics.

COS 4802. Special Topics. 2 Credit Hours.
Special Topics.

COS 4803. Special Topics. 3 Credit Hours.
Special Topics.

City Planning (CP)

CP 2233. Sustainable Urban Development. 3 Credit Hours.
This course introduces students to the theory and practice of sustainability as applied to the built environment at scales from the site to the megaregion.

CP 2698. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member. Undergraduate research under the guidance of a faculty member for the first years and sophmores.

CP 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member. Undergraduate research under the guidance of a faculty member for first years and sophomores.

CP 4010. Foundations of Urban and Regional Development. 3 Credit Hours.
The course describes the economic function of cities and the significant factors that shape their growth and development.

CP 4020. Introduction to Urban and Regional Planning. 3 Credit Hours.
This course provides an overview of the planning of cities and metropolitan regions. The legal and historical context as well as substantive areas of urban planning are addressed.

CP 4030. The City and Its Technology. 3 Credit Hours.
This course places urban infrastructure technology within the larger context of planning and development. The social and economic aspects of these systems are highlighted.

CP 4040. The City in Fiction and Film. 3 Credit Hours.
Examines images and perceptions of the urban environment as portrayed in literature and cinema. Explores the social, economic, and cultural contexts that impact on conception of the city.

CP 4050. Negotiation, Facilitation, and Conflict Management. 3 Credit Hours.
Theoretical and practical instruction on techniques of negotiation and consensus building using case studies and training exercises.

CP 4052. Sustainable Cities Studio. 3 Credit Hours.
This course provides students with a faculty-supervised community engagement experience in developing a sustainability-related project for a non-profit, business, or government agency.

CP 4105. Land Conservation. 3 Credit Hours.
This course considers the distinctive American view of land and history of the conservation movement, then discusses the why and how of modern land conservation.

CP 4190. Introduction to Climate Change Planning. 3 Credit Hours.
This course equips students with the knowledge and methods necessary to undertake the next generation of state, local, corporate, and enterprise climate action planning.

CP 4210. Environmental Planning and Impact Assessment. 3 Credit Hours.
Covers the principles of environmental planning and decision making. Examines the methods and processes, and environmental impact assessment and regulation.

CP 4310. Urban Transportation and Planning. 3 Credit Hours.
This course is designed to introduce the fundamentals of urban transportation planning and policy and is applicable to students in a variety of concentrations of study. The purpose of the course will be to acquaint students with transportation planning as a profession and the types of projects that transportation planners are required to conduct.

CP 4510. Fundamentals of Geographic Information Systems. 3 Credit Hours.
The course provides a basic understanding of the tools for collecting, storing, and analyzing spatially distributed data. Basic issues of software design and application are covered.

CP 4541. Environmental Geographic Information Systems. 3 Credit Hours.
This course focuses on the application of geographic information systems (GIS) to environmental problems. It highlights the types and sources of data appropriate to those applications.

CP 4545. Climate Change Analytics. 3 Credit Hours.
This course addresses the global problem of climate change using powerful, recently-developed tools from the fields of data science and geospatial analytics.

CP 4570. Socioeconomic Geographic Information Systems. 3 Credit Hours.
This GIS course addresses the collection, management, analysis, and interpretation of spatial social, economic, housing, and demographic information.

CP 4610. Introduction to Real Estate Investment. 3 Credit Hours.
Introduction to real estate analysis and utilization. Subjects include attributes of real property, value determinations, appraisal, investment analysis, market analysis, asset management, and public aspects.

CP 4620. Housing and Real Estate Economics. 3 Credit Hours.
Examination of private and public sector approaches to housing. Economic theory of durable goods, demand elasticities, applied market research analyses, and history of public intervention.

CP 4698. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member. Undergraduate research under the guidance of a faculty member for juniors and seniors.

CP 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member. Undergraduate research under the guidance of a faculty member for juniors and seniors.

CP 4811. Special Topics. 1 Credit Hour.
Topics of current interest not covered in other courses in the department.

CP 4812. Special Topics. 2 Credit Hours.
Topics of current interest not covered in other courses in the department.

CP 4813. Special Topics. 3 Credit Hours.
Topics of current interest not covered in other courses in the department.

CP 4814. Special Topics. 4 Credit Hours.
Topics of current interest not covered in other courses in the department.

CP 4815. Special Topics. 5 Credit Hours.
Topics of current interest not covered in other courses in the department.

CP 4901. Special Problems. 1-21 Credit Hours.

CP 6002. Introduction to Fields of Planning. 2 Credit Hours.
Introduction to the various subfields of planning through reading, discussion, and guest lectures by practicing planners. Course also covers professional ethics and career planning and development.

CP 6005. Freehand Drawing for Planners. 1 Credit Hour.
This courses teaches planning students through drawing to record, analyze, conceptualize, and represent commonly recurring physical and diagrammatic relationships that occur in the physical environment.

CP 6006. Visualization for Planners. 1 Credit Hour.
Explores visual and representational techniques and methods for physical planning, introducing a common set of computer applications designed to enhance visual representation and communication.

CP 6012. Theory and History of Planning. 4 Credit Hours.
Examines theories of planning and the public interest. Considers the roles of planners within the American political system and the historical development of the planning profession.

CP 6016. Growth Management Law and Implementation. 3 Credit Hours.
Study of legal framework of planning focusing on managing development to achieve desired outcomes for the economy, society, and the environment.

CP 6024. Quantitative and Computer Methods. 4 Credit Hours.
Introduction to computing and quantitative methods in planning. Discusses commonly used data sources, data management, presentation techniques, and planning analytical models.

CP 6025. Advanced Planning Methods. 4 Credit Hours.
Analytical methods in planning including inferential statistics, linear regression, and analysis of variance and how they are applied to planning problems.

CP 6031. Economic Analysis for Planning. 3 Credit Hours.
Applications of economic principles to planning, including market theory, public goods, externalities, cost benefit analysis, and project economics.

CP 6032. Urban and Regional Development Theory. 3 Credit Hours.
Study of theories in the structure and function of cities and regions. Emphasis on the economic forces shaping urban development.

CP 6034. Demographic and Economic Analysis of Urban Areas. 3 Credit Hours.
This course considers the social and economic structure of urban areas from a demographic perspective. Population structure, population change, and migration are explored.

CP 6035. Theory and History of Planning. 3 Credit Hours.
Examines theories of planning and the public interest, the intellectual and historical development of the planning profession, and the roles of planners within political systems.

CP 6036. Community Dynamics and Engagement. 2 Credit Hours.
Study of theories and dynamics of community-building, with a focus on working in communities, equity and inclusive community engagement.

CP 6037. Planning Law, Regulation and Implementation. 3 Credit Hours.
Study of legal framework of planning focusing on managing development and increasing opportunity to achieve desired outcomes for the economy, society, and the environment.

CP 6052. Applied Planning Studio. 4 Credit Hours.
Analysis and preparation of alternatives for an existing neighborhood, community, or region. Emphasis on application of planning skills in a real-world situation.

CP 6053. Applied Planning Studio (Urban Design). 6 Credit Hours.
The studio investigates urban physical settings. It emphasizes processes from visual representation, performanece evaluations to design decision making of future sustainable urban systems.

CP 6055. Planning Studio. 5 Credit Hours.
Analysis and preparation of alternatives for an existing neighborhood, community, or region. Emphasis on application of planning skills in a real-world situation.

CP 6105. Land Conservation. 3 Credit Hours.
This course considers the distinctive American view of land and history of the conservation movement, then discusses the why and how of modern land conservation.

CP 6112. Introduction to Land Use Planning. 3 Credit Hours.
This course introduces students to land use planning. The basic rationale for land use planning and its form in different states is covered.

CP 6122. Land Use Planning Methods. 3 Credit Hours.
This course explores the techniques of land use planning and applies them to specific land use types.

CP 6190. Introduction to Climate Change Planning. 3 Credit Hours.
This course equips students with the knowledge and methods necessary to develop the next generation fo state, local, corporate, and enterprise climate action planning.

CP 6213. Urb Env Plan & Design. 3 Credit Hours.
This course introduces students to the basic theoretical and analytical underpinnings of urban environmental planning and design.

CP 6214. Environmental Planning and Impact Assessment. 3 Credit Hours.
Examines the principles, processes, and methods of environmental planning. Focus on environmental science and its use in impact assessment and project evaluation.

CP 6217. Climate Change and the City. 3 Credit Hours.
The course explores land use and urban design strategies for adapting to climate change in cities and on local hazard mitigation policy.

CP 6223. Policy Tools for Environmental Management. 3 Credit Hours.
The course covers the regulatory, market, and procedural tools used to manage the environment. It examines the strengths and weaknesses of alternative techniques.

CP 6233. Sustainable Urban Development. 3 Credit Hours.
Explores the principles and practice of sustainable urban development and the role of planning.

CP 6241. Water Resources Planning. 3 Credit Hours.
Fundamentals of water resources planning and watershed management. Emphasis on urban water resources problems, policies, and practices.

CP 6243. Health Impact Assessment. 3 Credit Hours.
Students conduct an HIA, evaluate a completed HIA and propose approaches to institutionalizing HIA in institutions that traditionally do not focus on health outcomes.

CP 6250. Hazardous Waste Planning and Management. 3 Credit Hours.
Examines the planning tools and management techniques for the proper use, storage, transport, and disposal of hazardous material and waste products.

CP 6261. Environmental Law. 3 Credit Hours.
This course introduces students to the framework of legislation that shapes environmental planning and policy, including NEPA, Clean Air Act, and Clean Water Act.

CP 6311. Introduction to Transportation Planning. 4 Credit Hours.
Overview course in transportation planning including basic principles to understanding transportation, current transportation problems, transportation policy, and decision-making processes and methods.

CP 6321. Transportation Planning Methods and Investment Decisions. 4 Credit Hours.
Review of transportation methods and how they interface with investment decisions. How transportation planners at the local, regional, state, and federal levels employ methods.

CP 6331. Land Use and Transportation Interaction. 3 Credit Hours.
Overview of land use and transportation planning principles, how development impacts transportation, how transportation investments impact development patterns and air quality.

CP 6341. Urban Design and Non-Motorized Accessibility. 3 Credit Hours.
Examines role and opportunity to make walking and biking viable travel options in urban environments and how urban environments need to be designed to encourage non-motorized travel.

CP 6351. Transportation and Economic Development. 3 Credit Hours.
Impact of transportation infrastructure investments on economic outcomes at a range of geographic scales including neighborhood, municipality, regional, and statewide.

CP 6361. Regional Transportation Planning and Administration. 3 Credit Hours.
This course will address the administrative, political, methodological, and social issues underlying the regional transportation planning process.

CP 6412. Foundations of Local Economic Development Planning and. 3 Credit Hours.
Policy Introduction to local economic development planning, examining theory, process and practice, international and regional factors, public and private roles.

CP 6422. Economic Development Analysis and Practice. 3 Credit Hours.
This course focuses on strategy development, methods of analysis, and approaches to practice for urban and regional economic development policy and planning.

CP 6432. Industrial Restructuring and Its Planning Implications. 3 Credit Hours.
Examines industrial restructuring trends and theoretical frameworks; develops industry case studies; and considers economic development planning's role in industrial restructuring.

CP 6442. Equity, Social Justice, and Economic Development. 3 Credit Hours.
Explores concepts and theories of equity and social justice, analysis of indicators of (in)justice/equity, and economic development planning's role in promoting equity and social justice.

CP 6452. Urban Development Policy. 3 Credit Hours.
Introduces elements of urban policy and economic development by examining them historically, nationally, and locally. Approaches to urban development and redevelopment are analyzed.

CP 6514. Introduction to Geographic Information Systems. 3 Credit Hours.
This course introduces students to spatial analysis using geographic information systems. Fundamentals of software design and geographic data are covered.

CP 6521. Advanced Geographic Information Systems. 3 Credit Hours.
The course provides students with advanced spatial analysis techniques including network analysis, three-dimensional surface modeling, and GIS application development.

CP 6531. Introduction to Remote Sensing. 3 Credit Hours.
This course introduces students to the collection and use of satellite imagery and other remote sensing data.

CP 6541. Environmental Analysis Using GIS. 3 Credit Hours.
This course focuses on the application of geographic information systems (GIS) to environmental problems. It highlights the types and sources of data appropriate to those applications.

CP 6542. Transport & GIS. 3 Credit Hours.
Transportation data models, data processing, modeling, and service delivery in geographical information systems.

CP 6543. Public Health Analytics. 3 Credit Hours.
Presents a comprehensive socioecological framework for conducting healthy places research and practice, and metrics and analytical methods to measure and model health determinants and outcomes.

CP 6545. Climate Change Analytics. 3 Credit Hours.
This course addresses the global problem of climate change using powerful, recently-developed tools from the fields of data science and geospatial analytics.

CP 6551. Spatial Analysis of Socioeconomic Data. 3 Credit Hours.
This course provides students with an in-depth study of the spatial distribution of human activity, including population, housing, and employment. Credit not allowed for both CP 6551 and CP 6570.

CP 6552. Design of Smart Urban Systems. 3 Credit Hours.
The course integrates data analytics, systems science and urban design. It covers theories, methods, modeling tools and case studies in the context of smart cities.

CP 6561. Geodemographics: Data Sources and Methods. 3 Credit Hours.
Explores important secondary data sources used by planners and analysts working with smaller geographic areas. Experience with hardware and software used to analyze data.

CP 6570. Socioeconomic GIS. 3 Credit Hours.
This advanced GIS course addresses the collection, management, analysis, and interpretation of spatial social, economic, housing, and demographic information. Credit not allowed for both CP 6570 and CP 6551.

CP 6581. Programming for Geographic Information Systems. 3 Credit Hours.
This course teaches fundamental programming skills for geoprocessing and data presentation in a geographic information system environment. The primary languages used are Python and Javascript.

CP 6591. GIS Professionalization. 1 Credit Hour.
This course provides MSGIST students with a bridge from the academic world to the professional GIS world.

CP 6592. Capstone Project Research. 1 Credit Hour.
This course allows students to select a MSGIST capstone project topic, conduct a professional and academic literature review, and assemble required spatial datasets.

CP 6595. GIS Systems Design and Management. 3 Credit Hours.
This course equips students to address a range of issues related to GIS data acquisition, database design, system configuration, and project management.

CP 6596. GIS Capstone Project. 3 Credit Hours.
Students plan and execute a major professional project using standard GIS methodologies, and communicate the project results in written, graphic, and public presentation formats.

CP 6611. Principles of Real Estate Finance and Development. 3 Credit Hours.
Introduction to principles of real estate finance, focusing on the role the public sector plays in making desirable development projects financially feasible.

CP 6612. Community Development. 3 Credit Hours.
This course will examine neighborhood-based efforts, public policy, trends and practices that have shaped community development in American inner city communities since 1950.

CP 6621. Real Estate Market Research. 3 Credit Hours.
Introduction to real estate market research with particular focus on analyses of housing and office markets.

CP 6630. Government and Housing Markets. 3 Credit Hours.
Examination of the operation of local housing markets and national, state, regional, and local housing policies.

CP 6640. Applied Real Estate Development Methods. 3 Credit Hours.
Application of the development process, market and financial feasibility analyses, and public policy to large development projects. Extensive use of case studies involving professional developers.

CP 6680. Citizen Participation and Community Engagement. 3 Credit Hours.
This course discusses planners' reasons fro engaging communitites in the planning process, evaluates various engagement methods, and produces a guide to direct future practice.

CP 6701. Urban Transportation Planning. 3 Credit Hours.
An overview course on the history, finance, operations, modeling, politics, environmental impacts, and planning of urban transportation systems in the United States.

CP 6702. Urban Transportation Planning Laboratory. 1 Credit Hour.
Transportation planning/engineering laboratory and field experience.

CP 6704. Introduction to Global Development. 3 Credit Hours.
Introduces the goals, theories and key institutional actors involved in Global Development.

CP 6760. Negotiation and Conflict Management. 3 Credit Hours.
Practical and theoretical instruction on techniques of negotiation and consensus building using training exercises and case studies. Emphasizes environmental, policy, planning, and development disputes. Crosslisted with PUBP 6760.

CP 6811. Negotiation, Facilitation, and Conflict Management. 3 Credit Hours.
Theoretical and practical instruction on techniques of negotiation and consensus building using case studies and training exercises.

CP 6815. Cinema City. 3 Credit Hours.
Explores people's response to cities, augmenting the empirical analysis that is urban studies domain with the subjective perspectives of cinematic artists.

CP 6821. Basic Methods of Policy Analysis and Planning. 3 Credit Hours.
Synthesizes elements of the program core's analytic techniques and employs them in a case study context. Cases address urban policy, planning, and management.

CP 6825. Public Sector Finance and Budgeting. 3 Credit Hours.
Theory and practice of public finance. Emphasis on applications in local government revenue collection, budgeting, and expenditure analysis.

CP 6831. Urban Growth and Infrastructure Systems. 3 Credit Hours.
This course provides students with a basic understanding of urban infrastructure systems and their role in shaping urban growth and development.

CP 6832. Introduction to Urban Design. 3 Credit Hours.
An introduction to the study, research, and practice of urban design examining traditional design principles and their application to the contemporary city.

CP 6834. Urban Design Policy: Analysis and Implementation. 3 Credit Hours.
Urban design policy making and its implementation including an analysis of the behavioral basis for policies that promote quality in built form. Credit not allowed for both CP 6834 and ARCH 6303.

CP 6836. Urban Ecological Design. 3 Credit Hours.
This course engages the contemporary issues of urban ecology and its articulation to design. It explores relationship between urban forms, and flows of ecology, energy, material, water and information. Credit not allowed for both CP 6836 and ARCH 6447.

CP 6850. Public Health and the Built Environment. 2 Credit Hours.
This interdisciplinary course examines how cities and neighborhoods can have both positive and adverse effects on human health, and produces recommendations to improve these outcomes.

CP 6960. Urban Analytics Capstone Project. 1 Credit Hour.
Students prepare to execute a major professional project using urban analytics methodologies and communicate the project results in written, graphic, and public presentation formats.

CP 6962. Urban Analytics Capstone Project. 5 Credit Hours.
Students plan and execute a major professional project using urban analytics methodologies, and communicate the project results in written, graphic, and public presentation formats.

CP 6XXX. City Planning Elective. 1-21 Credit Hours.

CP 7000. Master's Thesis. 1-21 Credit Hours.
Provides students with an opportunity to pursue advanced research under the guidance of a faculty committee.

CP 7999. Preparation for Ph.D. Qualification Exam. 1-21 Credit Hours.
Preparation for the Ph.D. Qualification Exam.

CP 8000. Doctoral Planning Seminar. 1 Credit Hour.
This course provides students and faculty an opportunity to present and discuss planning research.

CP 8012. PhD Foundations Seminar. 1 Credit Hour.
Incoming City and Regional Planning doctoral students reflect upon research, assess opportunities afforded by doctoral education, and develop a plan of study for the program.

CP 8022. PhD Seminar in Research and Pedagogy. 1 Credit Hour.
Students conceptualize and share ongoing research with their peers, develop professional and pedagogical skills, and explore issues of student and career development.

CP 8200. Advanced Planning Theory. 3 Credit Hours.
Seminar on planning theory, including philosophy of science, political philosophy and ethical theory. The course explores the theoretical basis for planning as a social activity. Credit not allowed for both CP 8200 and COA 8520.

CP 8300. Advanced Urban and Regional Development Theory. 3 Credit Hours.
Examines principal urban-regional economic, and spatial theories for explaining economic, social and physical forces influencing locations, growth and decline of cities and regions. Credit not allowed for both CP 8300 and COA 8540.

CP 8400. Research Design and Qualitative Methods. 3 Credit Hours.
Examines issues associated with the design and methodological implementation of planning and applied social research, with a focus on techniques for qualitative inquiry. Credit not allowed for both CP 8400 and COA 8510.

CP 8505. Advanced Quantitative Research Methods for Planning, Policy and Design. 3 Credit Hours.
This course addresses two complementary topics: the design of quantitative research related to planning, design, and policy; and advanced statistical techniques for accomplishing such research. Credit not allowed for both CP 8505 and COA 8510.

CP 8813. Special Topics in Land Use Planning. 3 Credit Hours.
Topics of current interest in land use planning.

CP 8822. Special Topics. 2 Credit Hours.
Special Topics in City Planning.

CP 8823. Special Topics in Environmental Planning. 3 Credit Hours.
Topics of current interest in environmental planning.

CP 8833. Special Topics in Transportation Planning. 3 Credit Hours.
Topics of current interest in transportation planning.

CP 8843. Special Topics in Economic Development. 3 Credit Hours.
Topics of current interest in economic development.

CP 8851. Special Topics in GIS. 1 Credit Hour.
Topics of current interest in Geographic Information Systems.

CP 8852. Special Topics in GIS. 2 Credit Hours.
Topics of current interest in Geographic Information Systems.

CP 8853. Special Topics in Geographic Information Systems. 3 Credit Hours.
Topics of current interest in geographic information systems.

CP 8863. Special Topics in Land Development. 3 Credit Hours.
Topics of current interest in land development.

CP 8873. Special Topics in Urban Design. 3 Credit Hours.
Topics of current interest in urban design.

CP 8876. Special Topics in Urban Design. 6 Credit Hours.
Special Topics.

CP 8881. Special Topics in City and Regional Planning. 1 Credit Hour.
Topics of current interest in city and regional planning.

CP 8882. Special Topics in City and Regional Planning. 2 Credit Hours.
Topics of current interest in city and regional planning.

CP 8883. Special Topics in City and Regional Planning. 3 Credit Hours.
Topics of current interest in city and regional planning.

CP 8900. Special Problems. 1-21 Credit Hours.
Special problems of current interest.

CP 8901. Special Problems. 1-21 Credit Hours.
Special problems of current interest.

CP 8902. Special Problems. 1-21 Credit Hours.
Special problems of current interest.

CP 8990. Applied Research Paper. 1-21 Credit Hours.
The applied research paper requires students to demonstrate their ability to organize and execute professional-level work in consultation with a faculty member.

CP 8997. Teaching Assistantship. 1-9 Credit Hours.
For graduate students holding graduate teaching assistantships.

CP 8998. Research Assistantship. 1-9 Credit Hours.
For graduate students holding graduate research assistantships.

CP 8999. Preparation for Doctoral Dissertation. 1-21 Credit Hours.

CP 9000. Doctoral Dissertation. 1-21 Credit Hours.
For City Planning Ph.D. candidates writing their dissertations.

Computer Science (CS)

CS 1100. Freshman Leap Seminar. 1 Credit Hour.
Small group discussions with first year students are led by one or more faculty members and include a variety of foundational, motivational, and topical subjects for computationalist.

CS 1171. Introductory Computing in MATLAB. 1 Credit Hour.
For students with a solid introductory computing background needing to demonstrate proficiency in the MATLAB language.

CS 1301. Introduction to Computing. 3 Credit Hours.
Introduction to computing principles and programming practices with an emphasis on the design, construction and implementation of problem solutions use of software tools.

CS 1301R. Introduction to Computing for Computer Science Recitation. 0 Credit Hours.
Recitation for CS 1301.

CS 1315. Introduction to Media Computation. 3 Credit Hours.
Introduction to computation (algorithmic thinking, data structures, data transformation and processing, and programming) in a media and communication context. Credit not awarded for both CS 4452 and CS 1315.

CS 1315R. CS 1315 Recitation. 0 Credit Hours.
Recitation for CS 1315.

CS 1316. Representing Structure and Behavior. 3 Credit Hours.
Modeling the structure of media (e.g., music, graphical scenes) using dynamic data structures. Designing objects as encapsulations of structure and behavior. Algorithms for simulating objects. May not be taken for credit by students who have credit for CS 1322.

CS 1331. Introduction to Object Oriented Programming. 3 Credit Hours.
Introduction to techniques and methods of object-oriented programming such an encapsulation, inheritance, and polymorphism. Emphasis on software development and individual programming skills.

CS 1331R. CS 1331 Recitation. 0 Credit Hours.
Recitation for CS 1331.

CS 1332. Data Structures and Algorithms for Applications. 3 Credit Hours.
Computer data structures and algorithms in the context of object-oriented programming. Focus on software development towards applications.

CS 1332R. CS 1332 Recitation. 0 Credit Hours.
Recitation for CS 1332.

CS 1371. Computing for Engineers. 3 Credit Hours.
Foundations of computing with an introduction to design and analysis of algorithms and an introduction to design and construction of programs for engineering problem-solving.

CS 1371R. CS 1371 Recitation. 0 Credit Hours.
Recitation for CS 1371.

CS 1372. Structured Program Design for Engineers. 3 Credit Hours.
Design, analysis and implementation of programs for engineering problem-solving using ANSI Standard C, with an introduction to C++.

CS 1801. Special Topics. 1 Credit Hour.
Courses of timely interest to the profession, conducted by resident or visiting faculty.

CS 1802. Special Topics. 2 Credit Hours.
Courses of timely interest to the profession, conducted by resident or visiting faculty.

CS 1803. Special Topics. 3 Credit Hours.
Courses of timely interest to the profession, conducted by resident or visiting faculty.

CS 1804. Special Topics. 4 Credit Hours.
Courses of timely interest to the profession, conducted by resident or visiting faculty.

CS 1805. Special Topics. 5 Credit Hours.
Courses of timely interest to the profession, conducted by resident or visiting faculty.

CS 1XXX. Computer Sci Elective. 1-21 Credit Hours.

CS 2050. Introduction to Discrete Mathematics for Computer Science. 3 Credit Hours.
Proof methods, strategy, correctness of algorithms over discrete structures. Induction and recursion. Complexity and order of growth. Number theoretic principles and algorithms. Counting and computability. Credit not allowed for both CS 2050 and CS 2051.

CS 2050R. CS 2050 Recitation. 0 Credit Hours.
Recitation for CS 2050.

CS 2051. Honors - Induction to Discrete Mathematics for Computer Science. 3 Credit Hours.
Proof methods, strategy, correctness of algorithms over discrete structures. Induction and recursion. Complexity and order of growth. Number theoretic principles and algorithms. Counting and computability. Credit not allowed for both CS 2051 and CS 2050.

CS 2110. Computer Organization and Programming. 4 Credit Hours.
An introduction to basic computer hardware, machine language, assembly language, and C programming.

CS 2200. Computer Systems and Networks. 4 Credit Hours.
A broad exposure to computer system structure and networking including software abstractions in operating systems for orchestrating the usage of the computing resources.

CS 2261. Media Device Architectures. 4 Credit Hours.
Controlling the interface between hardware and software in media devices. Machine-level programming (e.g., in C) to create graphics, generate sound, and support user interaction.

CS 2316. Data Manipulation for Science and Industry. 3 Credit Hours.
Reading, manipulating, and exporting data for engineering, business, and scientific applications. Covers GUI's, File I/O, basic SQL, and web scraping. Emphasis on software development.

CS 2316R. CS 2316 Recitation. 0 Credit Hours.
Recitation for CS 2316.

CS 2335. Software Practicum. 3 Credit Hours.
Methods for solving large programming problems. Techniques for quality assurance, managing programs, working in teams, analyzing problems, and producing effective solutions.

CS 2340. Objects and Design. 3 Credit Hours.
Object-oriented programming methods for dealing with large programs. Focus on quality processes, effective debugging techniques, and testing to assure a quality product.

CS 2345. Advanced Practical Object-Oriented Programming. 4 Credit Hours.
This course presents important programming principles that should be considered when using a non-automatic memory management complex language (such as C++). Templating, generic programming, resource acquisition is initialization (RAII), and smart pointers are a few examples. Credit not awarded for both CS 2345 and ECE 2036.

CS 2600. Knowledge Representation and Processing. 4 Credit Hours.
Introduction to the representation and manipulation of complex symbolic and sub-symbolic information.

CS 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

CS 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

CS 2701. Startup Lab: Introduction to Technology Ventures. 3 Credit Hours.
Elements of technology venture creation including opportunity identification and validation, ideation, customer discovery, markey analysis, minimum viable product development, business models, intellectual property, and capital raises. Cross-listed with COE 2701.

CS 2701R. CS 2701 Recitation. 0 Credit Hours.
Recitation for CS 2701.

CS 2801. Special Topics. 1 Credit Hour.
Courses of timely interest to the profession, conducted by resident or visiting faculty.

CS 2802. Special Topics. 2 Credit Hours.
Courses of timely interest to the profession, conducted by resident or visiting faculty.

CS 2803. Special Topics. 3 Credit Hours.
Courses of timely interest to the profession, conducted by resident or visiting faculty.

CS 2804. Special Topics. 4 Credit Hours.
Courses of timely interest to the profession, conducted by resident or visiting faculty.

CS 2805. Special Topics. 5 Credit Hours.
Courses of timely interest to the profession, conducted by resident or visiting faculty.

CS 2XXX. Computer Sci Elective. 1-21 Credit Hours.

CS 3001. Computing, Society, and Professionalism. 3 Credit Hours.
Examines the role and impact of information and communication technology in society, with emphasis on ethical, professional, and public policy issues.

CS 3101. Computer Science Ventures. 3 Credit Hours.
Students will learn how computer-science-based ventures are developed. The course is project-based. Students propose, analylze, pitch, design, implement, package and market web-2.0 and virtual-world-based products and services.

CS 3210. Design of Operating Systems. 3 Credit Hours.
Operating systems concepts, including multi-threading, scheduling, synchronization, communication, and access control. Projects will cover design and implementation of several operating systems components.

CS 3220. Computer Structures: Hardware/Software Codesign of a Processor. 3 Credit Hours.
Principles in pipelined processor design, with emphasis on the need for a close interaction between code generation and architecture.

CS 3240. Languages and Computation. 3 Credit Hours.
Interpreters as abstract machines and the tools used to construct them, such as scanners and parsers. An introduction to models of computation as embodied by different programming languages. Limits of and relationships between these models.

CS 3251. Computer Networking I. 3 Credit Hours.
Introduction to problems in computer networking, including error recovery, medium access, routing, flow control, and transport. Emphasis on current best practice. Includes programming of networked applications.

CS 3300. Introduction to Software Engineering. 3 Credit Hours.
Team-based project class to introduce and apply software engineering principles and practices.

CS 3311. Part 1 of a 2 semester project design and implementation sequence conjoined with Tech Communications. 1 Credit Hour.
Part 1 of a 2 semester project design and implementation sequence conjoined with Technical Communications. Prepare requirements, design and project plans. Develop a basic prototype of the desired system. Project is completed in CS 3312-Project Implementation. Credit will not be awared for CS 3311 and CS 4911.

CS 3312. Project Implementation. 2 Credit Hours.
The second part of a 2 semester project design and implementation sequence conjoined with Technical Communications. Implement a project designed in CS 3311. Credit will not be awarded for CS 3312 and CS 4911.

CS 3451. Computer Graphics. 3 Credit Hours.
Geometric constuctions; transformations; perception; reflection models; photorealistic; non-photorealistic, and image-based rendering; rendering software and API's; triangle-mesh processing; graphic acceleration; user-interaction, design and animation.

CS 3510. Design and Analysis of Algorithms. 3 Credit Hours.
Basic techniques of design and analysis of efficient algorithms for standard computational problems. NP-Completeness. Credit not allowed for both CS 3510 and CS 3511.

CS 3511. Design and Analysis of Algorithms, Honors. 3 Credit Hours.
Techniques of design and analysis of efficient algorithms for standard computational problems. NP-Completeness Project. Credit not allowed for both CS 3511 and CS 3510.

CS 3600. Introduction to Artificial Intelligence. 3 Credit Hours.
An introduction to artificial intelligence and machine learning. Topics include intelligent system design methodologies, search and problem solving, supervised and reinforced learning.

CS 3630. Introduction to Perception and Robotics. 3 Credit Hours.
Covers fundamental problems and leading solutions for computer and robot perception and action from the point of view of autonomous robot navigation.

CS 3651. Prototyping Intelligent Devices. 4 Credit Hours.
Hands-on course teaching the fundamentals of electronics of electrical and mechanical prototyping.

CS 3651R. CS 3651 Recitation. 0 Credit Hours.
Recitation for CS 3651.

CS 3743. Analysis of Emerging Technologies. 3 Credit Hours.
Analysis of emerging technologies and their impacts for firm practice, market practice, policy, and society. Credit not allowed for both CS 3743 and MGT 3743 or ME 3743.

CS 3744. Managing Product, Service & Technology Development. 3 Credit Hours.
Analysis of the managerial challenges of the product development process.

CS 3750. Human Computer Interface Design and Evaluation. 3 Credit Hours.
Human computer interface is considered in terms of user-system compatibility. Concepts in human factors and interface design are covered in relation to capabilities of both humans and computers. Crosslisted with PSYC 3750.

CS 3751. Introduction to User Interface Design. 3 Credit Hours.
Describes the characteristics of interaction between humans and computers and demonstrates techniques for the design and evaluation of user interfaces and computational systems.

CS 3790. Introduction to Cognitive Science. 3 Credit Hours.
Multidisciplinary perspectives on cognitive science. Interdisciplinary approaches to issues in cognition, including memory, language, problem solving, learning, perception, and action. Crosslisted with PST, PSYC, and ISYE 3790.

CS 3801. Special Topics. 1 Credit Hour.
Courses of timely interest to the profession, conducted by resident or visiting faculty.

CS 3802. Special Topics. 2 Credit Hours.
Courses of timely interest to the profession, conducted by resident or visiting faculty.

CS 3803. Special Topics. 3 Credit Hours.
Courses of timely interest to the profession, conducted by resident or visiting faculty.

CS 3804. Special Topics. 4 Credit Hours.
Courses of timely interest to the profession, conducted by resident or visiting faculty.

CS 3805. Special Topics. 5 Credit Hours.
Courses of timely interest to the profession, conducted by resident or visiting faculty.

CS 3873. Special Topics. 3 Credit Hours.
Special Topics in Computer Science.

CS 3XXX. Computer Sci. 1-21 Credit Hours.

CS 4001. Computing, Society, and Professionalism. 3 Credit Hours.
Examines the role and impact of information and communication technology in society, with emphasis on ethical, professional, and public policy issues. Credit not allowed for both CS 4001 and 4002.

CS 4002. Robots and Society. 3 Credit Hours.
Examines the role and impact of robotics, distributed sensing and actuation, ubiquitous computing and related technology in society, emphasizing ethical, professional and public policy issues. Credit not allowed for both CS 4001 and 4002.

CS 4003. AI, Ethics, and Society. 3 Credit Hours.
This course covers various Artificial Intelligence and bias mitigation techniques that can be used to counterbalance the potential misuse and abuse of learning from data.

CS 4005. Next-Generation Computing Technologies. 3 Credit Hours.
Students will explore new paradigms in how content is created, distributed, and consumed, with hands-on demos of next-generation computing technologies.

CS 4010. Introduction to Computer Law. 3 Credit Hours.
Provides an introduction to copyrights, patents, trade secrets, trademarks, and commercial law pertaining to computer software and hardware.

CS 4052. Systems Analysis and Design. 3 Credit Hours.
An introductory course on the development life cycle of business information systems. It covers analysis and design tools and methodology. Credit not allowed for both CS 4052 and MGT 4045.

CS 4057. Business Process Analysis and Design. 3 Credit Hours.
Business processes are the mechanisms by which work is organized and performed. This course covers the analysis of business technology. Credit will not be awarded for both CS 4057 and MGT 4057.

CS 4210. Advanced Operating Systems. 3 Credit Hours.
Operating system abstractions and their implementations, multi-threading, efficient inter-address communication, high-level synchronization, introduction to multi-processor and distributed operating systems, real-time systems. Credit is not awarded for both CS 4210 and CS 6210.

CS 4220. Programming Embedded Systems. 3 Credit Hours.
Design principles, programming techniques, and case studies of embedded real-time systems. Interface techniques and devices. Representations and reasoning about physical processes.Credit not awarded for both CS 4220 and CS 6235.

CS 4220R. CS 4220 Recitation. 0 Credit Hours.
Recitation for CS 4220.

CS 4233. Parallel Computer Architecture. 3 Credit Hours.
The objective of this course is to develop an in-depth understanding of the design, implementation, and evaluation of modern parallel computers. Credit not allowed for both CS 4233 and CS 7110.

CS 4235. Introduction to Information Security. 3 Credit Hours.
Terms/concepts, threats, controls; problem definition; comprehensive information security model; security for operating systems, databases, network/distributed systems; administering security; legal/ethical/policy issues. Credit not allowed for both CS 4235 and CS 6035.

CS 4237. Computer and Network Security. 3 Credit Hours.
Fundamental concepts and principles of computer security, operating system and database security, secret key and public key cryptographic algorithms, hash functions, authentication, firewalls and intrusion detection systems, IPSec ad VPN, and wireless security.

CS 4238. Computer Systems Security. 3 Credit Hours.
Trusted computing base, hardware support for protection and virtualization, authentication, access control and authorization, discretionary and mandatory security policies, secure kernel design, and secure databases. Students cannot receive credit for CS 4238 and CS 6238.

CS 4239. Enterprise Cybersecurity Management. 3 Credit Hours.
The duties and concerns of an enterprise Chief Information Security Officer including strategy, cybersecurity operations, risk management, and governance.

CS 4240. Compilers, Interpreters, and Program Analyzers. 3 Credit Hours.
Study of techniques for the design and implementation of compilers, interpreters, and program analyzers, with consideration of the particular characteristics of widely used programming languages.

CS 4245. Introduction to Data Mining and Analysis. 3 Credit Hours.
Computational techniques for analysis of large, complex datasets, covering fundamental aspects as well as modern data mining and analysis techniques. Cross-listed with ISYE 4245.

CS 4251. Computer Networking II. 3 Credit Hours.
Principles of computer networks, including medium access, ARQ protocols, routing, congestion avoidance, and control. Emphasis on design options and tradeoffs. Includes significant network application programming.

CS 4255. Introduction to Network Management. 3 Credit Hours.
Introduction to SNMP-based network management. Practical application to network and system management including hands-on lab practice.

CS 4260. Telecommunications Systems. 3 Credit Hours.
Study of telecommunication systems emphasizing functional roles of the various portions of the system and how various functional components support and interact with one another.

CS 4261. Mobile Applications and Services for Converged Networks. 3 Credit Hours.
This course provides an introduction to mobile applications and services with an emphasis on voice and data service integration in modern commercial networks.

CS 4262. Network Security. 3 Credit Hours.
Fundamental concepts of network information security, including applied cryptography, secure access methods, and vulnerabilities in network protocols and network applications. Students cannot receive credit for CS 4262 and CS 6262.

CS 4263. Psychology of Cybersecurity. 3 Credit Hours.
This course will explore psychological processes relevant to cybersecurity. Students will gain an appreciation for psychological influence factors inherent in the current cyberspace environment.

CS 4270. Data Communications Laboratory. 3 Credit Hours.
Detailed study of the principles of data transmission systems and their performance, reinforced by laboratory exercises.

CS 4280. Survey of Telecommunications and the Law. 3 Credit Hours.
Overview of telecommunication regulation at the federal, state, and judicial levels; review of FCC policies and restrictions on Bell operating companies under the AT&T Consent Agreement.

CS 4290. Advanced Computer Organization. 3 Credit Hours.
Topics concerning the hardware design of computer systems. Advanced techniques in high-performance pipelined central processing units. Memory and I/O systems. Parallel processors including shared-memory multiprocessors and cluster computers. Credit is not allowed for both CS 4290 and any of the following courses: CS 6290, ECE 4100, ECE 6100.

CS 4320. Introduction to Software Processes. 3 Credit Hours.
The course will provide students with an overall context in which software systems are developed from the viewpoint of processes that support development. Software engineering is described as the set of activities developers engage in to create high-quality products within schedule and budget constraints.

CS 4330. Software Engineering Applications. 3 Credit Hours.
Software engineering methods specific to classes of applications or systems, including information systems and embedded, real-time systems.

CS 4342. Software Generation, Testing, and Maintenance. 3 Credit Hours.
Methods and principles for program generation, testing, and managing the evolution of software systems.

CS 4365. Introduction to Enterprise Computing. 3 Credit Hours.
A survey of basic software tools and techniques used in mission-critical systems and applications, combined with in-depth study of fundamental principles underlying enterprise computing. Credit not allowed for both 4365 and CS 6365.

CS 4392. Programming Languages. 3 Credit Hours.
Fundamentals of programming language design and theory. Topics include formal semantics and type systems for imperative, functional, and parallel languages; lambda calculus and its variants; the Curry-Howard Correspondence; techniques for proving language properties and verifying program specifications.

CS 4400. Introduction to Database Systems. 3 Credit Hours.
Comprehensive coverage of mainstream database concepts such as the entity-relationship model, relational databases, query languages, and database design methodology. Includes a project. Credit not allowed for both CS 4400 and CS 6402.

CS 4420. Database System Implementation. 3 Credit Hours.
Study of fundamental software components/algorithms of a database system, including the file manager, query engine, lock manager, and recovery manager. Includes a project component. Credit not allowed for both CS 4420 and CS 6422.

CS 4423. Advanced Database System Implementation. 3 Credit Hours.
Study of advanced topics in implementing a database system, including the query optimizer, concurrency control and recovery protocols. Includes a project component.

CS 4432. Information Systems Design. 3 Credit Hours.
The analysis, design, and implementation of information systems. Topics include requirements analysis, design representations, implementation techniques, and evaluation of systems.

CS 4440. Emerging Database Technologies and Applications. 3 Credit Hours.
The course will cover current developments including distributed, object-oriented, temporal-spatial, Web-based, mobile, and active database technologies, and data warehousing and mining applications.

CS 4452. Human-Centered Computing Concepts. 3 Credit Hours.
Introduction to programming and human-centered principles of computing based on a communications and media computation context. Introduces user interface programming. Credit not awarded for both CS 4452 and CS 1315.

CS 4455. Video Game Design and Programming. 3 Credit Hours.
Techniques for electronic game design and programming, including graphics game engines, motion generation, behavioral control for autonomous characters, interaction structure, social and interface issues of multi-user play, and the business aspects of game development. Credit not allowed for both CS 4455 and CS 6457.

CS 4460. Introduction to Information Visualization. 3 Credit Hours.
Introduction to principles and techniques of information visualization, the presentation of primarily abstract data to help people understand, analyze and make sense of data. Students cannot receive credit for both CS 4460 and CS 6730.

CS 4460R. CS 4460 Recitation. 0 Credit Hours.
This recitation supports the information visualization (CS 4460) course. Sessions will focus on introducing students to technical work with visualization programming languages and grammars important to the course.

CS 4464. Computational Journalism. 3 Credit Hours.
A study of computational and technological advancements in journalism with emphasis on technologies for developing new tools and their potential impact on news and information. Credit not allowed for both CS 4464 and CS 6465.

CS 4470. Introduction to User Interface Software. 3 Credit Hours.
Concepts, techniques, structures, and strategies for implementation of interactive software. Credit not awarded for both CS 4470 and CS 6456.

CS 4472. Design of Online Communities. 3 Credit Hours.
Introduction to the design of online communities. Students study an existing community in depth. Credit not allowed for both CS 4472 and CS 6470.

CS 4475. Computational Photography. 3 Credit Hours.
An introductory course on the scientific, technical, perceptual, and aesthetic principles of pictures. Emphasis is on the techniques of image formation, analysis, merging, modification and their use for depiction of reality on a 2D medium of photographs.

CS 4476. Introduction to Computer Vision. 3 Credit Hours.
Introduction to computer vision including fundamentals of image formation, camera imaging geometry, feature detection and matching, stereo, motion estimation and tracking, image classification and scene understanding. Credit will not be awarded for both CS 4476 and CS 4495 or CS 6476.

CS 4480. Digital Video Special Effects. 3 Credit Hours.
A study of digital multimedia and the analysis and synthesis of digital video. Special attention paid to techniques for generating video special effects.

CS 4488. Procedural Content Generation. 3 Credit Hours.
Students will learn algorithmic techniques for creating geometric models and images that can be used for games, feature films or virtual reality.

CS 4495. Computer Vision. 3 Credit Hours.
An introduction to computer vision and machine perception. An intensive study of the process of generating a symbolic description of the scene by interpretation of images(s).

CS 4496. Computer Animation. 3 Credit Hours.
Motion techniques for computer animation and interactive games (keyframing, procedural methods, motion capture, and simulation) and principles for storytelling, composition, lighting, and interactivity.

CS 4497. Computational Aesthetics. 3 Credit Hours.
Aesthetics plays a key role in society and economy. Students will invent and test beautification algorithms for colors, music, and animations and more.

CS 4510. Automata and Complexity Theory. 3 Credit Hours.
Computational machine models and their language classes. Undecidability. Resource-bounded computations. Central complexity-theoretic concepts such as complexity classes, reducibility and completeness.

CS 4520. Approximation Algorithms. 3 Credit Hours.
Approximation algorithms for NP-hard optimization problems, design and analysis techniques for such algorithms. Credit not allowed for both CS 4520 and CS 7520.

CS 4530. Randomized Algorithms. 3 Credit Hours.
Efficient randomized algorithms with improved performance over deterministic algorithms, or for NP-hard optimization problems, design and analysis techniques for such algorithms. Credit not allowed for both CS 4530 and CS 7530.

CS 4540. Advanced Algorithms. 3 Credit Hours.
Advanced techniques for designing and analyzing efficient algorithms for combinatorial, algebraic, and number theoretic problems. Credit not allowed for both CS 4540 and CS 6505 or CS 4540 and CS 6515.

CS 4550. Scientific Data Processing and Visualization. 3 Credit Hours.
Foundations and algorithms underlying the development and application of tools for the efficient transmission, analysis, filtering, and visualization of large scientific data sets.

CS 4560. Verification of Systems. 3 Credit Hours.
Technique for verifying, validating and testing software and hardware systems. Topics covered will include modeling, abstraction methods, evaluation and certification, and computer-aided verification methods.

CS 4590. Principles and Applications of Computer Audio. 3 Credit Hours.
A well-rounded exploration of digital audio and its importance in current research and applications. Exposes students to the principles, technology, and current research of computer audio.

CS 4605. Mobile and Ubiquitous Computing. 3 Credit Hours.
Investigates the infrastructure required to develop mobile and ubiquitous computing applications and establishes major research themes and experimental practices.Credit not awarded for both CS 4605 and CS 7470.

CS 4611. Artificial Intelligence Problem Solving. 3 Credit Hours.
Basic concepts and methods of AI problem solving, knowledge representation, reasoning, and learning.

CS 4613. Knowledge Systems Engineering. 3 Credit Hours.
Techniques for constructing large knowledge-based systems. Advanced symbolic AI techniques. Constraint systems.

CS 4615. Knowledge-Based Modeling and Design. 3 Credit Hours.
Information-processing theories of modeling and design; topics include design decision-making, problem-solving and learning, and knowledge-based modeling and design.

CS 4616. Pattern Recognition. 3 Credit Hours.
An introductory course on pattern classification and decision problems with applications to character recognition, image analysis, and speech recognition.

CS 4622. Case-Based Reasoning. 3 Credit Hours.
Based on human problem-solving, CBR has had many successes in industry and research. Topics include case representation, indexing and retrieval, similarity assessment, adaptation, learning. Credit not allowed for both CS 4622 and CS 7620.

CS 4625. Intelligent and Interactive Systems. 3 Credit Hours.
Explores how human-computer interaction and machine learning can interact to create personalized information environments. Emphasis on current research efforts from both fields.

CS 4632. Advanced Intelligent Robotics. 3 Credit Hours.
Hands-on course in which students program autonomous mobile robots and solve complex tasks for robot teams.

CS 4635. Knowledge-Based Artificial Intelligence. 3 Credit Hours.
Structured knowledge representation; knowledge-based methods of reasoning and learning; problem-solving, modeling and design.

CS 4641. Machine Learning. 3 Credit Hours.
Machine learning techniques and applications. Topics include foundational issues; inductive, analytical, numerical, and theoretical approaches; and real-world applications. Credit not awarded for both CS 4641 and CS 7641/CSE 6740/ISYE 6740/ECE 4252.

CS 4644. Deep Learning. 3 Credit Hours.
This course will cover the fundamental underpinnings and practice of deep learning, including neural network architectures, optimization algorithms, and applications to perception and Artificial Intelligence.

CS 4646. Machine Learning for Trading. 3 Credit Hours.
This course introduces students to the real world challenges of implementing machine learning based strategies including the algorithmic steps from information gathering to market orders.Credit not awarded for both CS 4646 and CS 7646.

CS 4649. Robot Intelli Planning. 3 Credit Hours.
We investigate algorithms for robots and complex systems that make intelligent decisions. Emphasis on the theoretical and empirical properties of classical, geometric, stochastic/dynamic planning.

CS 4650. Natural Language Understanding. 3 Credit Hours.
Methodologies for designing systems that comprehend natural language. Topics include lexical analysis, parsing, interpretation of sentences, semantic representation, organization of knowledge, and inference mechanisms. Credit not allowed for both CS 4650 and CS 7650.

CS 4660. Introduction to Educational Technology. 3 Credit Hours.
Introduction to the theory and practice of educational technology. Covers learning theory applicable to educational technology, explains major research findings. Credit not awarded for both CS 4660 and CS 6460.

CS 4665. Educational Technology: Design and Evaluation. 3 Credit Hours.
Intensive project class in which students design, implement, and evaluate a piece of educational technology, applying the theory learned in Introduction to Educational Technology.

CS 4670. Computer-Supported Collaborative Learning. 3 Credit Hours.
Research and practice in computer-supported collaborative learning. Review of existing systems and research, as well as evaluation and design methods.

CS 4675. Internet Computing Systems, Services and Applications. 3 Credit Hours.
Focusing on fundamental issues, concepts, techniques, and technical challenges that are critical for designing and developing Internet systems, services and applications. Credit not allowed for both CS 4675 and CS 6675.

CS 4685. Pervasive Systems and Networking. 3 Credit Hours.
In-depth study of systems and wireless networking issues in enabling pervasive computing environments and applications using a hand-on approach.

CS 4690. Empirical Methods for User Interface Design and Evaluation. 3 Credit Hours.
Introduction to empirical methods for gathering requirements and evaluating the end-user and usability of software systems.

CS 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

CS 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

CS 4710. Introduction to Computing Concepts for Bioinformatics. 4 Credit Hours.
Introduction to programming concepts and computing tools such as formal models and algorithms with applications from conceptual biology. May not be used by computer science majors for degree credit.

CS 4723. Inter Capstone Design. 3 Credit Hours.
Entrepreneurial Junior Design. Teams comprised of CS, ECE, and ME students will design and build prototypes of their invention ideas and explore market fit.

CS 4725. Information Security Strategies and Policies. 3 Credit Hours.
Information security vulnerabilities and risks; legal, cost, privacy, and technology constraints; derivation of strategies; technical and procedural means of achieving desired results. Credit will not be awarded for both CS 4725 and CS 6725 or MGT 4725 or MGT 6725 or PUBP 4725.

CS 4726. Privacy, Technology, Policy, and Law. 3 Credit Hours.
This course takes a multi-disciplinary approach to privacy, a topic of great interest in the technology, policy, ethics, law, and business realms. Credit will not be awarded for both CS 4726 and MGT 4726 or MGT 6726 or CS 6726.

CS 4731. Game AI. 3 Credit Hours.
Examines the expressive possibilities of artificial intelligence techniques in computer games. Students learn AI programming techniques, and how they strongly interface with game design.

CS 4741. Integrative Management Development-Project Preparation. 3 Credit Hours.
Individual and group-based experiential learning activities to develop integrated human system management skills that prepare students for more successful capstone collaboration and learning. Credit not allowed for both CS 4741 and MGT 4741 or ME 4741.

CS 4742. Integrated Computing and Management Capstone Project. 4 Credit Hours.
Project-based course for students in Computing and Management minor to work in interdisciplinary teams on projects provided by corporate affiliates. Credit not allowed for both CS 4742 and MGT 4742 or ME 4742.

CS 4745. Information and Communication Technologies and Global Development. 3 Credit Hours.
Focus on technology design, adoption, and use as seen through the lens of global development.

CS 4752. Philosophical Issues in Computation. 3 Credit Hours.
Metaphysical and epistemological issues in the foundations, methods, and implications of computing. Issues include: minds, brains, and machines; representation and language; simulating nature. Crosslisted with PST 4752.

CS 4770. Mixed Reality Experience Design. 3 Credit Hours.
Focuses on informal design, integration of media theory, HCI and technology issues. Significant group design projects. Credit not awarded for both CS 4770 and LMC 4733/6340/CS 6770.

CS 4791. Integrative Project in Cognitive Science. 3 Credit Hours.
An integrative course in cognitive science focusing on the integration and use of concepts and skills from cognitive science. A different integrative project or set of projects will be taken on each semester; students will contribute on the basis of their background and skill. Crosslisted with PST, PSYC, and ISYE 4791.

CS 4792. Design Project in Cognitive Science. 3 Credit Hours.
Individual project with a cognitive science faculty member, designed as a supplement to the student's senior design project or thesis in their major area. Crosslisted with PST, PSYC, and ISYE 4792.

CS 4793. Integrative Perspectives in Cognitive Science. 3 Credit Hours.
An integrative course in cognitive science which uses a focus topic to deepen interdisciplinary perspective and develop cognitive science knowledge and skills.

CS 4795. GPU Programming for Video Games. 3 Credit Hours.
3-D graphics pipelines. Physically-based rendering. Game engine architectures. GPU architectures. Graphics APIs. Vertex and pixel shader programming. Post-processing effects. Deferred rendering.

CS 4801. Special Topics. 1 Credit Hour.
Courses of timely interest to the profession, conducted by resident or visiting faculty.

CS 4802. Special Topics. 2 Credit Hours.
Courses of timely interest to the profession, conducted by resident or visiting faculty.

CS 4803. Special Topics. 3 Credit Hours.
Courses of timely interest to the profession, conducted by resident or visiting faculty.

CS 4804. Special Topics. 4 Credit Hours.
Courses of timely interest to the profession, conducted by resident or visiting faculty.

CS 4805. Special Topics. 5 Credit Hours.
Courses of timely interest to the profession, conducted by resident or visiting faculty.

CS 4816. Special Topics. 6 Credit Hours.
Special Topics.

CS 4851. Special Topics. 1 Credit Hour.
Special Topics in CS - Lab.

CS 4853. Special Topics. 3 Credit Hours.
Special Topics in CS (lecture and supervised lab)

CS 4854. Special Topics. 4 Credit Hours.

CS 4863. Special Topics. 3 Credit Hours.
Special Topics.

CS 4873. Special Topics. 3 Credit Hours.

CS 4883. Special Topics. 3 Credit Hours.

CS 4893. Special Topics. 3 Credit Hours.
Special Topics for CS (lecture + lab).

CS 4901. Special Problems. 1-21 Credit Hours.
An investigation of significant areas of information in computer science. Guided study and research.

CS 4902. Special Problems. 1-21 Credit Hours.
An investigation of significant areas of information and computer science. Guided study and research.

CS 4903. Special Problems. 1-21 Credit Hours.
An investigation of significant areas of information and computer science. Guided study and research.

CS 4911. Design Capstone Project. 1-21 Credit Hours.
Team-based capstone experience allowing students to analyze a problem for a customer and manage the solution development through the full project life cycle.

CS 4912. Design Capstone Project. 3 Credit Hours.
Team-based capstone experience allowing students to analyze a problem for a customer and manage the solution development through the full project life cycle.

CS 4980. Research Capstone Project. 1-21 Credit Hours.

CS 4XXX. Computer Sci Elective. 1-21 Credit Hours.

CS 6010. Principles of Design. 3 Credit Hours.
This is an interactive hands-on course that will teach students the principles of design at the individual level.

CS 6035. Introduction to Information Security. 3 Credit Hours.
A broad spectrum of information security: threats, basic cryptography, software vulnerabilities, programming for malice, operating system protections, network security, privacy, data mining, computer crime.

CS 6150. Computing For Good. 3 Credit Hours.
Exploring challenges faced by underserved populations and developing countries from a computing perspective.

CS 6200. Graduate Introduction to Operating Systems. 3 Credit Hours.
This course teaches operating system abstractions, mechanisms, and their implementations, including for concurrency (threads) and synchronization, resource management (CPU, memory, I/O), and distributed services.

CS 6210. Advanced Operating Systems. 3 Credit Hours.
Introduction to graduate-level topics in operating systems using research papers, textbook excerpts, and projects. Provides students thorough comprehension of distributed and parallel computer systems. Credit is not awarded for both CS 4210 and CS 6210.

CS 6211. System Design for Cloud Computing. 3 Credit Hours.
Through in-depth presentations and hands-on projects for each layer of the full stack of cloud technologies, learners acquire the systems design skills for cloud computing.

CS 6220. Big Data Systems and Analytics. 3 Credit Hours.
This course will cover the concepts, techniques, algorithms, and systems of big data systems and data analytics, with strong emphasis on big data processing systems, fundamental models and optimizations for data analytics and machine learning, which are widely deployed in real world big data analytics and applications.

CS 6230. High-Performance Parallel Computing: Tools and Applications. 3 Credit Hours.
Introduction to MIMD parallel computation, using textbook excerpts, research papers, and projects on multiple parallel machines. Emphasizes practical issues in high-performance computing.

CS 6235. Real-Time System Concepts and Implementation. 3 Credit Hours.
Principles of real-time systems, as occurring in robotics and manufacturing, interactive, and multimedia applications. Reviews and uses real-time operating systems.Credit not awarded for both CS 6235 and CS 4220.

CS 6238. Secure Computer Systems. 3 Credit Hours.
Design principles of secure systems, authentication, access control and authorization, discretionary and mandatory security policies, secure kernel design, and secure databases.

CS 6241. Design and Implementation of Compilers. 3 Credit Hours.
Design and implementation of modern compilers, focusing upon optimization and code generation.

CS 6245. Compiling for Parallelism. 3 Credit Hours.
Design and implementation of compilers for parallel and distributed computers, focusing upon optimization and code generation.

CS 6246. Object-Oriented Systems and Languages. 3 Credit Hours.
Design and implementation of object-oriented systems. Aspect-oriented programming, type systems, OO language implementation (virtual dispatch, GC), OO language design (genericity, reflection, mixins).

CS 6250. Computer Networks. 3 Credit Hours.
Principles and practice of computer networks, including signaling and framing, error control, medium access, routing, congestion control, end-to-end transport, and network APIs.

CS 6255. Principles of Network Management. 3 Credit Hours.
Focus on network, system, and applications management. Principles and practice of various network management standards will be presented. Course includes project assignment.

CS 6260. Applied Cryptography. 3 Credit Hours.
Cryptographic algorithms, cryptanalysis, symmetric cryptography, public key cryptography, DES, AES, RSA, hash and MAC functions, digital signatures, pseudo-random generators, cryptographic protocols, SSL// TLS, SET. Credit not allowed for both CS 6260 and ECE 6280.

CS 6261. Security Operations and Incident Response. 3 Credit Hours.
The course covers the principles and technologies utilized in and the processes followed in responding to cybersecurity incidents and crises. The course utilizes real-life case studies to develop how these technologies and processes are applied within the cybersecurity industry.

CS 6262. Network Security. 3 Credit Hours.
Design principles of secure network protocols and systems, authentication, integrity, confidentiality, privacy, information hiding, digital watermarking, access control, firewall, intrusion detection, and case studies.

CS 6263. Intro to Cyber-Physical Systems Security. 3 Credit Hours.
This course provides an introduction to security issues relating to various cyber-physical systems including industrial control systems and those considered critical infrastructure systems.

CS 6264. Information Security Lab: System and Network Defenses. 3 Credit Hours.
This course will help students develop both in-depth knowledge and hands-on skills in a number of important cybersecurity areas, including software security, malware and threat analysis, end-point security, network security, web security, mobile security, and machine learning based security analytics.

CS 6265. Information Security Lab: Binary Exploitation. 3 Credit Hours.
This course covers advanced techniques for writing exploits, taught through an intense, hands-on security laboratory, following a cyberspace war game called Capture-The-Flag.

CS 6266. Information Security Practicum. 5 Credit Hours.
Capstone independent study placing each student in a commercial, industrial, academic, or government setting where they must solve real-world security problems.

CS 6267. Critical Infrastructures Security and Resilience. 3 Credit Hours.
Critical infrastructures are large cyber-physical networks essential to the well-being of the societies they serve. We study their resilience and security against a range of disruptions.

CS 6268. Psychology of Cybersecurity. 3 Credit Hours.
This course will explore psychological processes relevant to cybersecurity. Students will gain an appreciation for psychological influence factors inherent in the current cyberspace environment.

CS 6269. Formal Models and Methods for Information Assurance. 3 Credit Hours.
Logical foundations of high-assurance systems, formal models for access control, authentication, and trust; techniques for constructing high-assurance systems.

CS 6280. Performance Evaluation of Communication Networks. 3 Credit Hours.
Methods for evaluating the performance of communication networks with emphasis on modeling, mathematical analysis, computer simulation, and measurement.

CS 6290. High-Performance Computer Architecture. 3 Credit Hours.
Topics concerning very high-performance computers including techniques exploiting parallelism in single and multiple processor systems. Credit not allowed for both CS 6290 and any of the following courses: CS 4290, ECE 4100, ECE 6100.

CS 6291. Embedded Software Optimizations. 3 Credit Hours.
First, this course introduces the student to embedded domain-specific processor and instruction set design issues. Next, machine-specific optimizations for performance and for energy consumption are discussed.

CS 6300. Software Development Process. 3 Credit Hours.
The process of developing software systems. Includes development and assessment of processes, their instantiation in actual product development, and techniques ensuring quality of developed products.

CS 6301. Advanced Topics in Software Engineering. 3 Credit Hours.
This project-based course will cover fundamental principles, advanced techniques, and tools for the development of high-quality, industrial-strength software.

CS 6310. Software Architecture and Design. 3 Credit Hours.
Principles and concepts involved in the design and analysis of large software systems.

CS 6320. Software Requirements Analysis and Specification. 3 Credit Hours.
Methods and principles for determining, documenting, analyzing, and formally specifying requirements for software systems.

CS 6330. Software Generation, Testing, and Maintenance. 3 Credit Hours.
Introduction to methods and principles for programming, testing, and managing the evolution of software systems.

CS 6340. Advanced Topics in Software Analysis and Testing. 3 Credit Hours.
Fundamental prinicples and advanced techniques for static and dynamic program analysis and software testing. Software reliability, resilience, and trustworthiness.

CS 6365. Introduction to Enterprise Computing. 3 Credit Hours.
Survey of basic software concepts and techniques used in mission-critical systems and applications, combined with in-depth study of fundamental principles underlying enterprise computing. Credit not allowed for both CS 6365 and CS 4365.

CS 6390. Programming Language Design. 3 Credit Hours.
Design, structure, and goals of programming languages. Object-oriented, logic, functional, and traditional languages. Semantic models. Parallel programming languages.

CS 6400. Database Systems Concepts and Design. 3 Credit Hours.
Study of fundamental concepts with regard to relational databases. Topics covered include database design, query processing, concurrency control, and recovery. Credit not given for both CS 6400 and CS 6754.

CS 6402. Databases and Information Security. 3 Credit Hours.
Fundamentals of designing and using databases: conceptual data models to database-specific models, SQL, storage structures. Security-related topics include privacy, access control, backup, recovery, SQL injection. Credit not allowed for both CS 6402 and CS 4400.

CS 6411. Object-Oriented Database Models and Systems. 3 Credit Hours.
Study of advanced database concepts as they apply to object-oriented database systems. Topics include semantic data models, object-oriented query languages, tools, and applications.

CS 6421. Temporal, Spatial and Active Databases. 3 Credit Hours.
Study of advanced database concepts for temporal databases with emphasis on storage structure, processing and query languages, as well as active database concepts and implementation.

CS 6422. Database System Implementation. 3 Credit Hours.
Design and implementatuion of a databse system covering: storage manager, query optimizer, transaction manager, and recovery manager. Study of the advantages of different implementation algorithms. Credit not allowed for both CS 6422 and CS 4420.

CS 6423. Advanced Database System Implementation. 3 Credit Hours.
Study of advanced topics in implementing a database system, including the query optimizer, concurrency control and recovery protocols. Includes a project component.

CS 6430. Parallel and Distributed Database Systems and Applications. 3 Credit Hours.
Study of algorithms and performance in advanced databases. Systems include parallel, distributed, and client-server databases. Applications include data mining and on-line analytical processing.

CS 6440. Information to Health Informatics. 3 Credit Hours.
A broad review of the US health system and the application of informatics to the clinical practice of medicine, digital imaging, public health and bioinformatics.

CS 6451. Introduction to Human-Centered Computing. 3 Credit Hours.
Introduction to the range of issues across the HCC disciplines, including design and research methodologies: cognitive, social, and cultural theories; assessment and evaluation: ethical issues.

CS 6452. Prototyping Interactive Systems. 3 Credit Hours.
Introduction to design, prototyping and implementation of systems for human-centered computing. Focuses on core concepts in computer science and implications for interactive systems.

CS 6454. Qualitative Methods for Design of Human Computer Interaction. 3 Credit Hours.
Qualitative methods for HCI including data collection through interviews, observations and design, analysis using research and industry standards, and methods for communicating findings to industry.

CS 6455. User Interface Design and Evaluation. 3 Credit Hours.
Examines usability in the software development process with an emphasis on usability, requirements, methodology, design, and evaluation.

CS 6456. Principles of User Interface Software. 3 Credit Hours.
Considers the architectural and algorithmic principles behind the implementation of interactive software systems and the tools that support them. Credit not awarded for CS 6456 and CS 4470.

CS 6457. Video Game Design and Programming. 3 Credit Hours.
Techniques for electronic game design and programming, including graphics, game engines, animation, behavioral control for autonomous characters, interaction, social and interface issues of multi-user play. Credit not allowed for both CS 6457 and CS 4455.

CS 6460. Educational Technology: Conceptual Foundations. 3 Credit Hours.
Introduction to educational technology, with an emphasis on theoretical foundations. Introduces basic philosophies, approaches, and technologies. Analyzes issues surrounding technology's impact on education. Credit not awarded for both CS 4660 and CS 6460.

CS 6461. CS Education Research. 3 Credit Hours.
Introduction to computing education research (CER). History and influential early work. Learning goals for different populations. Design of research studies in CER.

CS 6465. Computational Journalism. 3 Credit Hours.
Technology is rapidly affecting how news information is gathered, reported, visualized, aggregated, summarized, distributed, and consumed. This class studies the computational technologies that impact journalism. Credit not allowed for both CS 6455 and CS 4464.

CS 6470. Design of Online Communities. 3 Credit Hours.
Introduction to the design of online communities. Students study an existing community in depth, and then develop a new community design. Credit not allowed for both CS 6470 and CS 4472.

CS 6471. Computational Social Science. 3 Credit Hours.
This graduate seminar focuses on text and network analysis of data with applications to domains such as political science, sociolinguistics, and public health.

CS 6474. Social Computing. 3 Credit Hours.
Design and prototype new social computing systems, as well as analyze social media data.

CS 6475. Computational Photography. 3 Credit Hours.
This class explores the impact of computation on the entire workflow of photography, from how light is captured by a camera, to how the images are processed, enhanced, and improved to generate novel photographs.

CS 6476. Introduction to Computer Vision GR. 3 Credit Hours.
Introduction to computer vision including fundamentals of image formation, camera imaging geometry, feature detection and matching, stereo, motion estimation and tracking, image classification and scene understanding. Credit not awarded for both CS 6476 and CS 4495 or CS 4476.

CS 6480. Computer Visualization Techniques. 3 Credit Hours.
Principles, techniques, and practice in data, information, multivariate, and scientific visualization. Includes visualization methods, data structures, examples, and tools.

CS 6485. Visualization Methods for Science and Engineering. 3 Credit Hours.
Algorithms, software, and practical applications of visualization techniques in science, engineering, business, and medicine. Includes data structures, multivariate visualization, interactive visualization, and visual representations and examples. Computer science students cannot receive credit for this course.

CS 6491. Foundations of Computer Graphics. 3 Credit Hours.
Mathematical/physical/perceptual principles and modeling/rendering techniques used to create, represent, display, and animate models of 3D shapes and their properties.

CS 6492. Shape Grammars. 3 Credit Hours.
Shape grammars are production systems using shape rewriting rules to perform computations with shapes.

CS 6497. Computational Aesthetics. 3 Credit Hours.
Aesthetics play a key role in society and economy. Students will invent and test beautification algorithms for colors, music, and animations and more.

CS 6505. Computability, Algorithms, and Complexity. 3 Credit Hours.
Important concepts from computability theory; techniques for designing algorithms for combinatorial, algebraic, and number-theoretic problems; basic concepts such as NP-Completeness from computational complexity theory. Credit not awarded for both CS 6505 and CS 4540/6515.

CS 6515. Introduction to Graduate Algorithms. 3 Credit Hours.
Design and analysis of algorithms on a graduate level, including dynamic programming, divide and conquer, FFT, graph and flow algorithms, RSA, linear programming, and NP-completedness.

CS 6520. Computational Complexity Theory. 3 Credit Hours.
Introduction to resource-bounded computations, central complexity-theoretic concepts such as complexity classes, reducibility, completeness, and intractability.

CS 6550. Design and Analysis of Algorithms. 3 Credit Hours.
Advanced techniques for designing and analyzing efficient algorithms for combinatorial, algebraic, and number-theoretic problems.

CS 6601. Artificial Intelligence. 3 Credit Hours.
Basic concepts and methods of artificial intelligence including both symbolic/conceptual and numerical/probabilistic techniques.

CS 6603. AI, Ethics, and Society. 3 Credit Hours.
This course covers various Artificial Intelligence and bias mitigation techniques that can be used to counterbalance the potential misuse and abuse of learning from data.

CS 6670. Distributed Control Algorithms. 3 Credit Hours.
Algorithms for synchronous, asynchronous, and partially synchronous networks; analysis, control, and implementation of distributed systems such as robot fleets, animal groups.

CS 6675. Advanced Internet Computing Systems and Applications. 3 Credit Hours.
Survey of basic Internet computing concepts and techniques used in Internet systems and applications, combined with in-depth study of fundamental principles underlying Internet computing. Credit not allowed for both CS 6675 and CS 4675.

CS 6705. Applications of Artificial Intelligence. 3 Credit Hours.
A study of the principles and practice of artificial intelligence in areas other than computer science, with particular focus on engineering, science, and business applications. Computer science majors cannot receive credit for this course.

CS 6725. Information Security Strategies and Policies. 3 Credit Hours.
Information security vulnerabilities and risks; legal, cost, privacy, and technology constraints; derivation of strategies; technical and procedural means of achieving desired ends. Credit not awarded for both CS 6725 and CS 4725/MGT 4725/6725/PUBP 4725/6725.

CS 6726. Privacy, Technology, Policy, and Law. 3 Credit Hours.
This course takes a multi-disciplinary approach to privacy, a topic of great interest in the technology, policy, ethics, law, and business realms. Credit will not be awarded for both CS 6726 and CS 4726 or MGT 4726 or MGT 6726.

CS 6727. Cyber Security Practicum. 5 Credit Hours.
Capstone independent study project placing each student in a commercial, academic or government setting where he or she identifies a major cyber security problem, and explores and evaluates a solution that addresses it with realistic assumptions about the organizational context. The chose problem must be approved by course instructor. Cross-listed with ECE and PUBP 6727.

CS 6730. Data Visualization: Principles and Applications. 3 Credit Hours.
Introductory course on design principles and applications of data visualization. This course teaches best practices for visualizing datasets from diverse domains intended to help people make sense of data. Students cannot receive credit for both CS 6730 and CS 4460.

CS 6745. Information and Communication Technologies and Global Development. 3 Credit Hours.
Focus on technology design, adoption, and use as seen through the lens of global development.

CS 6747. Advanced Topics in Malware Analysis. 3 Credit Hours.
This course covers advanced approaches for the analysis of malicious software and explores recent research and unsolved problems in software protection and forensics.

CS 6750. Human-Computer Interaction. 3 Credit Hours.
Describes the characteristics of interaction between humans and computers and demonstrates techniques for the evaluation of user-centered systems. Crosslisted with PSYC 6750.

CS 6753. Human-Computer Interaction-Professional Preparation and Practice. 1 Credit Hour.
Preparation for a professional career in HCI. Hands-on workshops in resume and portfolio building, interviewing, public speaking, team work. HCI career choices and trajectories.

CS 6754. Engineering Database Management Systems. 3 Credit Hours.
Modeling and managing engineering information systems, integration of design and manufacturing functions in engineering product development, logical models of engineering product and processes. Credit not given for CS 6400 and CS 6754. Crosslisted with ME 6754.

CS 6755. Human-Computer Interaction Foundations. 3 Credit Hours.
Describes the theory and practice of designing effective and efficient interactions between people and technology. Students do not receive credit for both CS 6755 and PSYC 6755.

CS 6763. Design of Design Environments. 3 Credit Hours.
Analysis of design processes; analysis of current design tools at both the user interface and functional levels; procedures for developing better design tools. Credit not allowed for both CS 6763 and ID 6763 or COA 6763.

CS 6764. Geometric Modeling. 3 Credit Hours.
Software development course focusing on 3D geometric constructions and modeling; emphasizes solid modeling and its role in design. Crosslisted with COA 6764.

CS 6770. Mixed Reality Experience Design. 3 Credit Hours.
Introduction to the design of Mixed Reality experiences. Focuses on informal design, integration of media theory, HCI and technology issues. Significant group design projects.Credit not awarded for both CS 6770 and CS 4770/LMC 4733/6340.

CS 6780. Medical Image Processing. 3 Credit Hours.
A study of methods for enhancing, analyzing, interpreting, and visualizing information from two- and three-dimensional data obtained from a variety of medical image modalities. Crosslisted with ECE and BMED 6780.

CS 6795. Introduction to Cognitive Science. 3 Credit Hours.
Multidisciplinary perspectives on cognitive science. Interdisciplinary approaches to issues in cognition, including memory, language, problem solving, learning, perception, and action. Crosslisted with ISYE and PSYC 6795.

CS 6998. HCI Master's Project. 1-9 Credit Hours.

CS 6999. Master's Project. 1-9 Credit Hours.
Final project for students completing a master's degree in the College of Computing. Repeatable for multi-semester projects.

CS 6XXX. Computer Sci Elective. 1-21 Credit Hours.

CS 7000. Master's Thesis. 1-21 Credit Hours.

CS 7001. Overview of Graduate Studies in Computing. 5 Credit Hours.
Research tools including computer systems, as well as fundamental problem-solving skills, are introduced. Lectures on current computing research are presented and projects are required. Credit not allowed in a program of study for a graduate degree.

CS 7110. Parallel Computer Architectures. 3 Credit Hours.
Issues in the design, implementation, and programming of parallel machines. Credit not allowed for both CS 7110 and CS 4233.

CS 7210. Distributed Computing. 3 Credit Hours.
Fundamental concepts in distributed systems, including global states, logical clocks, and failure models. Distributed algorithms and their implementations using advanced distributed programming systems.

CS 7230. Systems Software Design, Implementation, and Evaluation. 3 Credit Hours.
Design, implementation, and evaluation of systems software. Distributed/parallel applications will be constructed and evaluated using the systems support that is developed.

CS 7250. Broadband Networking Systems. 3 Credit Hours.
Focus on the data link layer and its relationship to layers below and above. Gigabit Ethernet, SONTET, fibre channel; media including wireless, satellite, xDSL, cable.

CS 7260. Internetworking Architectures and Protocols. 3 Credit Hours.
Detailed discussion of the problems and solution techniques that arise in internetworking. Topics include routing, addressing, quality of service, and security.

CS 7270. Networked Applications and Services. 3 Credit Hours.
End-to-end functional building blocks and their use in adaptive and non-adaptive applications, including multimedia: coding, compression, security, directory services.

CS 7280. Network Science: Methods and Applications. 3 Credit Hours.
Characteristics of real networks in nature and technology, network measurement methods, network analysis, evolving networks, dynamic network processes, co-evolution of structure and function.

CS 7290. Advanced Topics in Microarchitecture and organization of high-performance processors.. 3 Credit Hours.
Low-level organization and hardware algorithms for the implementation of modern high-performance microprocessors including concept designs and real-world case studies.

CS 7292. Reliability and Security in Computer Architecture. 3 Credit Hours.
Hardware support for process isolation, virtualization, debugging, and protection from side-channel attacks. Faults and failures, error tolerance, error rate budgeting, lifetime realiability of devices.

CS 7400. Introduction to Quantum Computing. 3 Credit Hours.
Provide background on quantum computing and equip students with the skills to write code and optimize quantum programs on real quantum computers.

CS 7450. Information Visualization. 3 Credit Hours.
Study of computer visualization principles, techniques, and tools used for explaining and understanding symbolic, structured, and/or hierarchical information. Includes data and software visualization.

CS 7451. Human-Centered Data Analysis. 3 Credit Hours.
This course covers the role of people in data science and visual data analysis, including cognitive processes, bias, perception, and decision-making theories and frameworks.

CS 7455. Issues in Human-Centered Computing. 3 Credit Hours.
In-depth focus on theoretical, methodological, conceptual, and technical issues across the HCC disciplines associated with humans (cognitive, biological, socio-cultural); design; ethics; and analysis and evaluation.

CS 7460. Collaborative Computing. 3 Credit Hours.
Introduction to computer-supported collaborative work, workflow automation, and meeting augmentation. The course deals with models, enabling technology, systems, and applications.

CS 7465. Educational Technology: Design and Evaluation. 3 Credit Hours.
Intensive project class in which students design, implement, and evaluate a piece of educational technology, applying the theory learned in Educational Technology: Conceptual Foundations.

CS 7467. Computer-Supported Collaborative Learning. 3 Credit Hours.
Computer-supported collaborative learning is the use of Internet-based technologies to support learning in social settings. Focus on issues of implementation and evaluation.

CS 7470. Mobile and Ubiquitous Computing. 3 Credit Hours.
Investigates the infrastructure required to develop mobile and ubiquitous computing applications and establishes major research themes and experimental practices. Credit not awarded for both CS 7470 and CS 4605.

CS 7476. Advanced Computer Vision. 3 Credit Hours.
Advanced topics in computer vision, which includes a deep dive into both the theoretical foundations of computer vision to the practical issues of building real systems that use computer vision. Credit will not be awarded for CS 7476 and CS 7495.

CS 7490. Advanced Image Synthesis. 3 Credit Hours.
Advanced techniques in realistic image synthesis based on the physics of light. Anti-aliasing, textures, surface reflectance, distribution ray tracing, volume rendering, radiosity, and image-based rendering.

CS 7491. 3D Complexity Techniques for Graphics, Modeling, and Animation. 3 Credit Hours.
Multiresolution, compression, collision, morphing, visibility, and computational geometry techniques for accessing, rendering, and animating complex 3D models in engineering, scientific, business, or entertainment applications.

CS 7492. Simulation of Biological Systems. 3 Credit Hours.
Study different computer simulation methods for use in investigating biological systems, including bio-moleculeS, cells and full organisms.

CS 7495. Computer Vision. 3 Credit Hours.
An introduction to computer vision and machine perception. An intensive study of the process of generating a symbolic description of the scene by interpretation of images(s). Credit will not be awarded for both CS 7495 and CS 7476.

CS 7496. Computer Animation. 3 Credit Hours.
Motion techniques for computer animation and interactive games (keyframing, procedural methods, motion capture, and simulation) and principles for storytelling, composition, lighting, and interactivity.

CS 7497. Virtual Environments. 3 Credit Hours.
An introduction to virtual reality and virtual environments. Issues covered will include VR technology, software design, 3D human-computer interaction, and applications for VR.

CS 7499. 3D Reconstruction and Mapping in Computer Vision, Robotics, and Augmented Reality. 3 Credit Hours.
In this course we study the principles and algorithms underlying 3D Reconstruction and Mapping in Computer Vision, Robotics, and Augmented Reality.

CS 7510. Graph Algorithms. 3 Credit Hours.
Algorithms for graph problems such as maximum flow, matching, network reliability, minimum cuts, covering, coloring, planarity, shortest paths, and connectivity. Crosslisted with MATH 7510 and ISYE 7510.

CS 7520. Approximation Algorithms. 3 Credit Hours.
Approximation algorithms for NP-hard optimization problems, design and analysis techniques for such algorithms. Credit not allowed for both CS 7520 and CS 4520.

CS 7525. Algorithmic Game Theory and Economics. 3 Credit Hours.
Algorithmic aspects of game theory covering topics at the intersection of computer science, economics, and game theory with applications to domains such as internet.

CS 7530. Randomized Algorithms. 3 Credit Hours.
Techniques for designing and analyzing randomized algorithms, derandomization techniques. Credit not allowed for both CS 7530 and CS 4530.

CS 7535. Markov Chain Monte Carlo Algorithms. 3 Credit Hours.
This course studies Markov Chain Monte Carlo algorithms, widely-used in a variety of scientific fields, focusing on mathematical techniques for analyzing their convergence rates.

CS 7540. Spectral Algorithms and Representations. 3 Credit Hours.
Spectral methods mathematics and algorithmic insights driving applications with large data sets in domains such as web-search, information-retrieval, and medical diagnosis and prediction.

CS 7545. Theoretical Foundations of Machine Learning. 3 Credit Hours.
This course provides a basic arsenal of powerful mathematical tools for the analysis of learning algorithms, focusing on both statistical and computational aspects.

CS 7560. Theoretical Foundations of Cryptography. 3 Credit Hours.
One-way functions, pseudorandomness, public-key and identity-based cryptography, commitment and zero knowledge.

CS 7610. Modeling and Design. 3 Credit Hours.
Information-processing theories of modeling and design; topics include design decision making, problem solving and learning, and knowledge-based modeling and design.

CS 7611. AI Problem Solving. 3 Credit Hours.
Basic concepts and methods of AI problem solving, knowledge representation, reasoning, and learning.

CS 7612. Artificial Intelligence Planning. 3 Credit Hours.
Symbolic numerical techniques that allow intelligent systems to decide how they should act in order to achieve their goals, including action and plan representation, plan synthesis and reasoning, analysis of planning algorithms, plan execution and monitoring, plan reuse and learning, and applications.

CS 7613. Knowledge Systems Engineering. 3 Credit Hours.
Techniques for constructing large knowledge-based systems. Advanced symbolic AI techniques. Constraint systems.

CS 7615. Knowledge Agents. 3 Credit Hours.
Knowledge-based interactive systems, knowledge-based autonomous agents, agent architectures, learning and adaptation, agent evolution.

CS 7616. Pattern Recognition. 3 Credit Hours.
This course provides an introduction to the theory and practice of pattern recognition. It emphasizes unifying concepts and the analysis of real-world datasets.

CS 7620. Case-Based Reasoning. 3 Credit Hours.
Topics include case representation, indexing and retrieval, adaptation, interpretive CBR, the cognitive model that CBR implies, and its implications for creativity, decision aiding, and education. Credit not allowed for both CS 7620 and CS 4622.

CS 7626. Introduction to Behavioral Imaging. 3 Credit Hours.
An introduction to the use of sensor data and machine learning methods to measure and model human behavior objectively and automatically for health applications.

CS 7630. Autonomous Robotics. 3 Credit Hours.
The principles and practice of autonomous robotics including behavior-based design and architectures, adaptive learning and team behavior, and the role of perception within robotic systems.

CS 7631. Autonomous Multi-Robot Systems. 3 Credit Hours.
In-depth examination of the current research on multi-robot systems. Students develop and critically analyze a multi-robot system.

CS 7632. Game Artificial Intelligence. 3 Credit Hours.
An exploration of how artificial intelligence is used in modern digital computer games. Credit will not be awarded for CS 7632 and CS 4731, CS 7632 and LCC 4731 or CS 7632 and LMC 4731.

CS 7633. Human-Robot Interaction. 3 Credit Hours.
Survey of the state of the art in HRI research, introduction to statistical methods for HRI research, research project studio.

CS 7634. AI Storytelling in Virtual Worlds. 3 Credit Hours.
An exploration of how artificial intelligence can enable us to use stories in virtual worlds for the purpose of entertaining, educatintg, and training human users.

CS 7636. Computational Perception. 3 Credit Hours.
Study of statistical and algorithmic methods for sensing people using video and audio. Topics include face detection and recognition, figure tracking, and audio-visual sensing.

CS 7637. Knowledge-Based AI. 3 Credit Hours.
Structured knowledge representation; knowledge-based methods of reasoning and learning; problem-solving, modeling and design.

CS 7638. Artificial Intelligence Techniques for Robotics. 3 Credit Hours.
AI techniques with applications to autonomous vehicles. Extensive programming exercises. Topics include probabilistic inference, Kalman/particle filters, planning/search algorithms, PID control, SLAM.

CS 7639. Cyber Physical Design and Analysis. 3 Credit Hours.
Cyber Physical Systems (CPS), including examples. Design methods. Formalisms: Different equations, finite-state machines. Analysis. Formal methods. Design processes, Model-Based Systems Engineering, Reference documents and regulations.

CS 7640. Learning in Autonomous Agents. 3 Credit Hours.
An in-depth look at agents that learn, including intelligent systems, robots, and humans. Design and implementation of computer models of learning and adaptation in autonomous intelligent agents.

CS 7641. Machine Learning. 3 Credit Hours.
Machine learning techniques and applications. Topics include foundational issues; inductive, analytical, numerical, and theoretical approaches; and real-world applications. Credit not awarded for both CS 7641 and CS 4641/CSE 6740/ISYE 6340.

CS 7642. Reinforcement Learning and Decision Making. 3 Credit Hours.
Efficient algorithms for multiagent planning, and approaches to learning near-optimal decisions using possibly partially observable Markov decision processes; stochastic and repeated games; and reinforcement learning.

CS 7643. Deep Learning. 3 Credit Hours.
This course will cover theory and practice of deep learning, including neural network and structured models, optimization algorithms, and applications to perception and Artificial Intelligence.

CS 7644. Machine Learning for Robotics. 3 Credit Hours.
Overview of a portfolio of machine learning techniques useful for robotic application: from regression to deep learning, applied on simulated real-time mobile robotic applications.

CS 7645. Numerical Machine Learning. 3 Credit Hours.
This course explores problems in classification/pattern recognition (OCR, speech, vision, fault detection, medical diagnosis), regression/function approximation, robot control, and reinforcement learning.

CS 7646. Machine Learning for Trading. 3 Credit Hours.
Introduces machine learning based trading strategies. Topics: Information processing, probabilistic analysis, portfolio construction, generation of market orders, KNN, random forests. Credit not awarded for both CS 4646 and CS 7646.

CS 7647. Machine Learning with Limited Supervision. 3 Credit Hours.
Explore advanced techniques in learning from visual data with limited human supervision through study of recently published research papers and completing a semester-long research project.

CS 7648. Interactive Robot Learning. 3 Credit Hours.
This course combines lectures in CS (Machine and Reinforcement Learning) and CogSci with a research seminar to enable students to develop learning from demonstration systems.

CS 7649. Robot Intelligence: Planning. 3 Credit Hours.
We investigate algorithms for robots and complex systems that make intelligent decisions. Emphasis on the theoretical and empirical properties of classical, geometric, stochastic/dynamic planning.

CS 7650. Natural Language. 3 Credit Hours.
Topics include lexical analysis, parsing, interpretation of sentences, semantic representation, organization of knowledge, inference mechanisms. Newer approaches combining statistical language processing and information retrieval techniques. Credit not allowed for both CS 7650 and CS 4650.

CS 7651. Human and Machine Learning. 3 Credit Hours.
Explores the gap between empirical research on human learning and models from machine learning. Covers symbolic, statistical, semantic space, neural network, unsupervised, and other approaches.

CS 7695. Philosophy of Cognition. 3 Credit Hours.
Examines problems in the foundations of cognition in relation to current issues in cognitive sciences. Topics include meaning, mental imagery, consciousness, and mind/body problem.

CS 7697. Cognitive Models of Science and Technology. 3 Credit Hours.
Examines how models of reasoning and representation developed in the cognitive sciences can provide a basis for an enriched understanding of scientific theories and research practices in science and technology.

CS 7741. Robotics Professional Preparation. 1 Credit Hour.
Preparation for a professional career in Robotics. Local & visiting speakers. Program introduction. Technical resume preparation. GT Robotics labs & resources.

CS 7742. Robotics Professional Preparation 2. 1 Credit Hour.
Preparation for a professional career in Robotics. Local & visiting speakers. Selecting and applying for Internship. Developing capstone project proposal. Public speaking practice and preparation.

CS 7743. Robotics Professional Preparation 3. 1 Credit Hour.
Preparation for a professional career in Robotics. Local & visiting speakers. Interview preparation & career search. Technical report writing and presentation.

CS 7750. Mathematical Foundations of Machine Learning. 3 Credit Hours.
Provides the mathematical background for two of the pillars of modern data science: linear algebra and applied probability.

CS 7751. Probabilistic Graphical Models in Machine Learning. 3 Credit Hours.
The course provides an introduction to theory and practice of graphical models in machine learning. It covers three main aspects; representation, probabilistic inference, and learning.

CS 7785. Introduction to Robotics Research. 3 Credit Hours.
Familiarizes students with the core areas of robotics; mechanics, control, perception, AI, and autonomy. Provides an introduction to the mathematical tools required in robotics research.

CS 7790. Cognitive Modeling. 4 Credit Hours.
A hands-on course covering a range of cognitive modeling methodologies. It explores the analysis, development, construction, and evaluation of models of cognitive processing. Crosslisted with ISYE and PSYC 7790.

CS 7999. Preparation for Doctoral Qualifying Exams. 1-21 Credit Hours.
Consent of the College required.

CS 8001. Seminar. 1 Credit Hour.
Group discussion of advanced topics in information and computer science. May not be used by computer science majors for degree credit.

CS 8002. Seminar. 2 Credit Hours.
Group discussion of advanced topics in information and computer science. May not be used by computer science majors for degree credit.

CS 8003. Seminar. 3 Credit Hours.
Group discussion of advanced topics in information and computer science. May not be used by computer science majors for degree credit.

CS 8004. Seminar. 4 Credit Hours.
Group discussion of advanced topics in information and computer science. May not be use by computer science majors for degree credit.

CS 8005. Seminar. 5 Credit Hours.
Group discussion of advanced topics in information and computer science. May not be used by computer science majors for degree credit.

CS 8006. Seminar. 6 Credit Hours.
Group discussion of advanced topics in information and computer science. May not be used by computer science majors for degree credit.

CS 8030. Software Engineering Seminar. 1 Credit Hour.
This seminar provides students with an opportunity to explore contemporary topics in software engineering.

CS 8740. Robotics Internship. 1-21 Credit Hours.
Graduate Internship at a partner company, GTRI or a GT Robotics lab.

CS 8741. Robotics Capstone Project. 3 Credit Hours.
Teams or individuals apply the knowledge and skills acquired throughout the MS program to a faculty supervised robotics project.

CS 8750. Robotics Research Foundation I. 3 Credit Hours.
Multidisciplinary research course supervised by two robotics faculty from different schools participating in the robotics Ph.D. program.

CS 8751. Robotics Research Foundation II. 3 Credit Hours.
Continuation of AE 8751 (Robotics Research Foundation I).

CS 8795. Colloquium in Cognitive Sciences. 1 Credit Hour.
Reading of research papers by leading cognitive scientists, attendance at their colloquia and meeting with them to discuss research. Crosslisted with ISYE and PSYC 8795.

CS 8801. Special Topics. 1 Credit Hour.
Special topics of current interest. Treatment of new developments in various areas of computing.

CS 8802. Special Topics. 2 Credit Hours.
Special topics of current interest. Treatment of new developments in various areas of computing.

CS 8803. Special Topics. 3 Credit Hours.
Special topics of current interest. Treatment of new developments in various areas of computing.

CS 8804. Special Topics. 4 Credit Hours.
Special topics of current interest. Treatment of new developments in various areas of computing.

CS 8805. Special Topics. 5 Credit Hours.
Special topics of current interest. Treatment of new developments in various areas of computing.

CS 8806. Special Topics. 6 Credit Hours.
Special topics of current interest. Treatment of new developments in various areas of computing.

CS 8811. Special Topics. 1 Credit Hour.
Special Topics in CS - Lab.

CS 8813. Special Topics. 3 Credit Hours.

CS 8816. Special Topics. 6 Credit Hours.

CS 8873. Special Topics. 3 Credit Hours.

CS 8893. Special Topics in Cognitive Science. 3 Credit Hours.
Topics of current interest in cognitive science.

CS 8901. Special Problems. 1-21 Credit Hours.
Small-group or individual investigation of advanced topics in computing. Guided study and research.

CS 8902. Special Problems. 1-21 Credit Hours.
Small-group or individual investigation of advanced topics in computing. Guided study and research.

CS 8903. Special Problems. 1-21 Credit Hours.
Small-group or individual investigation of advanced topics in computing. Guided study and research.

CS 8997. Teaching Assistantship. 1-9 Credit Hours.
For graduate students holding graduate teaching assistantships.

CS 8998. Research Assistantship. 1-6 Credit Hours.
For graduate students holding graduate research assistantships.

CS 8999. Doctoral Thesis Preparation. 1-21 Credit Hours.

CS 9000. Doctoral Thesis. 1-21 Credit Hours.

Computational Science & Engr (CSE)

CSE 6001. Introduction to Computational Science and Engineering. 1 Credit Hour.
This course will introduce students to major research areas in computational science and engineering.

CSE 6010. Computational Problem Solving for Scientists and Engineers. 3 Credit Hours.
Computing principles, computer architecture, algorithms and data structure; software development, parallelism. No credit for graduate students or undergraduates in Computer Science or Computational Media.

CSE 6040. Computing for Data Analysis: Methods and Tools. 3 Credit Hours.
Computational techniques needed for data analysis; programming, accessing databases, multidimensional arrays, basic numerical computing, and visualization; hands-on applications and case studies. Credit is will not be awarded for both CSE 6040 and CX 4240.

CSE 6140. Computational Science and Engineering Algorithms. 3 Credit Hours.
This course will introduce students to designing high-performance and scalable algorithms for computational science and engineering applications. The course focuses on algorithms design, complexity analysis, experimentation, and optimization, for important science and engineering applications.

CSE 6141. Massive Graph Analysis. 3 Credit Hours.
Algorithms and data structures for massive graphs; programming, parallelism; principles, challenges, opportunities in graph analysis; hands-on application, case studies.

CSE 6220. High Performance Computing. 3 Credit Hours.
This course will introduce students to the design, analysis, and implementation of high performance computational science and engineering applications.

CSE 6221. Multicore Computing: Concurrency and Parallelism on the Desktop. 3 Credit Hours.
This course will introduce students to the design and analysis of real-world algorithms on multicore computers.

CSE 6230. High Performance Parallel Computing: Tools and Applications. 3 Credit Hours.
Introduction to MIMD parallel computation, using textbook excerpts, resesarch papers, and projects on multiple parallel machines. Emphasizes practical issues in high-performance computing.

CSE 6236. Parallel and Distributed Simulation. 3 Credit Hours.
Algorithms and techniques used in parallel/distributed discrete event simulation systems. Synchronization algorithms, data distribution, applications to high performance analytic simulations and distributed virtual environments.

CSE 6240. Web Search and Text Mining. 3 Credit Hours.
Basic and advanced methods for Web information retrieval and text mining: indexing and crawling, IR models, link and click data, social search, text classification and clustering.

CSE 6241. Pattern Matching Algorithms. 3 Credit Hours.
Foundations and algorithms underlying the development and application of tools for the efficient searching, matching and discovery of discrete.

CSE 6242. Data and Visual Analytics. 3 Credit Hours.
The course introduces students to analysis and visualization of complex high dimensional data. Both theory and applications will be covered including several practical case studies.

CSE 6243. Advanced Topics in Machine Learning. 3 Credit Hours.
Advanced machine learning topics including graphical models, kernel methods, boosting, bagging, semi-supervised and active learning, and tensor approach to data analysis.

CSE 6250. Big Data Analytics for Healthcare. 3 Credit Hours.
Big data systems, scalable machine learning algorithms, health analytic applications, electronic health records.

CSE 6301. Algorithms for Bioinformatics and Computational Biology. 3 Credit Hours.
Foundations and algorithms underlying the development and application of tools for the efficient management and processing of biomolecular data.

CSE 6643. Numerical Linear Algebra. 3 Credit Hours.
Introduction to numerical solutions of the classical problems of linear algebra including linear systems, least squares, singular value decomposition, and eigen value problems. Crosslisted with MATH 6643.

CSE 6644. Iterative Methods for Systems of Equations. 3 Credit Hours.
Iterative methods for linear and nonlinear systems of equations including Jacobi, G-S, SOR, CG, multigrid, Newton, quasi-Newton, updating, and gradient based methods. Crosslisted with MATH 6644.

CSE 6710. Numerical Methods in Computational Science and Engineering I. 3 Credit Hours.
Introduction to numerical algorithms widely used in computational science and engineering. Numerical linear algebra, linear programming, and applications. Crosslisted with MATH 6710.

CSE 6711. Numerical Methods in Computational Science and Engineering II. 3 Credit Hours.
Efficient numerical techniques for solving partial differential equations and large-scale systems of equations arising from discretization of partial differential equations or variational problems in applications in science and engineering. Crosslisted with MATH 6711.

CSE 6730. Modeling and Simulation: Foundations and Implementation. 3 Credit Hours.
Foundations and algorithms concerning the development of conceptual models for systems, and their realization in the form of computer software; discrete and continuous models. Crosslisted with ECE 6730.

CSE 6740. Computational Data Analysis: Learning, Mining, and Computation. 3 Credit Hours.
Theoretical/computational foundations of analyzing large/complex modern datasets, including the fundamental concepts of machine learning and data mining needed for both resesarch and practice. Crosslisted with ISYE 6740. Credit not awarded for both CSE 6740 and CS 4641/7641/ISYE 6740.

CSE 6742. Modeling, Simulation and Military Gaming. 3 Credit Hours.
Focuses on the creation and use of modeling and simulation tools to analyze and train students regarding strategic events in international relations. Crosslisted with INTA 6742.

CSE 6748. Applied Analytics Practicum. 6 Credit Hours.
Practical analytics project experience applying ideas from the classroom to a significant project of interest to a business, government agency, or other organization.

CSE 6XXX. Comput. Sci. & Engr Elective. 1-21 Credit Hours.

CSE 7000. Master's Thesis. 1-21 Credit Hours.

CSE 7750. Mathematical Foundations of Machine Learning. 3 Credit Hours.
Provides the mathematical background for two of the pillars of modern data science: linear algebra and applied probability.

CSE 7751. Probabilistic Graphical Models in Machine Learning. 3 Credit Hours.
The course provides an introduction to theory and practice of graphical models in machine learning. It covers three main aspects; representation, probabilistic inference, and learning.

CSE 7850. Machine learning in computational biology. 3 Credit Hours.
Introduction to modern machine learning techniques in computational biology.

CSE 7999. Preparation for Doctoral Qualifying Examination. 1-21 Credit Hours.

CSE 7XXX. Comput. Sci. & Engr Elective. 1-21 Credit Hours.

CSE 8001. Computational Science and Engineering Seminar. 1 Credit Hour.
Group discussion concerning advanced topics in Computational Science and Engineering.

CSE 8002. Computational Science and Engineering Seminar. 2 Credit Hours.
Group discussion concerning advanced topics in Computational Science and Engineering.

CSE 8003. Computational Science and Engineering Seminar. 3 Credit Hours.
Group discussion concerning advanced topics in Computational Science and Engineering.

CSE 8004. Computational Science and Engineering Seminar. 4 Credit Hours.
Group discussion concerning advanced topics in Computational Science and Engineering.

CSE 8005. Computational Science and Engineering Seminar. 5 Credit Hours.
Group discussion concerning advanced topics in Computational Science and Engineering.

CSE 8801. Special Topics. 1 Credit Hour.
Topics of current interest in Computational Science and Engineering.

CSE 8802. Special Topics. 2 Credit Hours.
Topics of current interest in Computational Science and Engineering.

CSE 8803. Special Topics. 3 Credit Hours.
Topics of current interest in Computational Science and Engineering.

CSE 8804. Special Topics. 4 Credit Hours.
Topics of current interest in Computational Science and Engineering.

CSE 8805. Special Topics. 5 Credit Hours.
Topics of current interest in Computational Science and Engineering.

CSE 8901. Special Problems. 1-21 Credit Hours.
Small-group or individual investigation of advanced topics with a faculty member.

CSE 8902. Special Problems. 1-21 Credit Hours.
Small-group or individual investigation of advanced topics with a faculty member.

CSE 8903. Special Problems. 1-21 Credit Hours.
Small-group or individual investigation of advanced topics with a faculty member.

CSE 8997. Teaching Assistantship. 1-6 Credit Hours.
For students holding graduate teaching assistantships.

CSE 8998. Research Assistantship. 1-6 Credit Hours.
For students holding graduate research assistantships.

CSE 8999. Doctoral Thesis Preparation. 1-21 Credit Hours.

CSE 8XXX. Comput. Sci & Engr Elective. 1-21 Credit Hours.

CSE 9000. Doctoral Thesis. 1-21 Credit Hours.

Computational Mod, Sim, & Data (CX)

CX 1801. Special Topics in Computational Science and Engineering. 1 Credit Hour.
Course topics will vary. This course number will use to prototype new courses and/or offer courses on topics of timely interest. The final digit in the course number indicates the number of units offered awarded for the course.

CX 1802. Special Topics in Computational Science and Engineering. 2 Credit Hours.
Course topics will vary. This course number will be to prototype new courses and/or offer courses on topics of timely interest. The final digit in the course number indicates the number of units offered awarded for the course.

CX 1803. Special Topics in Computational Science and Engineering. 3 Credit Hours.
Course topics will vary. This course number will be used to prototype new courses and/or offer courses on topics of timely interest. The final digit in the course number indicates the number of units offered awarded for the course.

CX 1804. Special Topics in Computational Science and Engineering. 4 Credit Hours.
Course topics will vary. This course number will be used to prototype new courses and/or offer courses on topics of timely interest. The final digit in the course number indicates the number of units offered awarded for the course.

CX 1805. Special Topics in Computational Science and Engineering. 5 Credit Hours.
Course topics will vary. This course number will be used to prototype new courses and/or offer courses on topics of timely interest. The final digit in the course number indicates the number of units offered awarded for the course.

CX 1XXX. CSE Elective. 1-21 Credit Hours.

CX 2801. Special Topics in Computational Science and Engineering. 1 Credit Hour.
Course topics will vary. This course number will be used to prototype new courses and/or offer courses on topics of timely interest. The final digit in the course number indicates the number of units offered awarded for the course.

CX 2802. Special Topics in Computational Science and Engineering. 2 Credit Hours.
Course topics will vary. This course number will be used to prototype new courses and/or offer courses on topics of timely interest. The final digit in the course number indicates the number of units offered awarded for the course.

CX 2803. Special Topics in Computational Science and Engineering. 3 Credit Hours.
Course topics will vary. This course number will be used to prototype new courses and/or offer courses on topics of timely interest. The final digit in the course number indicates the number of units offered awarded for the course.

CX 2804. Special Topics in Computational Science and Engineering. 4 Credit Hours.
Course topics will vary. This course number will be used to prototype new courses and/or offer courses on topics of a timely interest. The final digit in the course number indicates the number of units offered awarded for the course.

CX 2805. Special Topics in Computational Science and Engineering. 5 Credit Hours.
Course topics will vary. This course number will be used to prototype new courses and/or offer courses on topics of timely interest. The final digit in the course number indicates the number of units offered awarded for the course.

CX 2XXX. CSE Elective. 1-21 Credit Hours.

CX 3801. Special Topics in Computational Science and Engineering. 1 Credit Hour.
Course topics will vary. This course number will be used to prototype new courses and/or offer courses on topics of timely interest. The final digit in the course number indicates the number of units offered awarded for the course.

CX 3802. Special Topics in Computational Science and Engineering. 2 Credit Hours.
Course topics will vary. This course number will be used to prototype new courses and/or offer on topics of timely interest. The final digit in the course number indicates the number of units offered awarded for the course.

CX 3803. Special Topics in Computational Science and Engineering. 3 Credit Hours.
Course topics will vary. This course number will be used to prototype new courses and/or offer courses on topics of timely interest. The final digit in the course number indicates the number of units offered awarded for the course.

CX 3804. Special Topics in Computational Science and Engineering. 4 Credit Hours.
Course topics will vary. This course number will be used to prototype new courses and/or offer courses on topics of timely interest. The final digit in the course number indicates the number of units offered awarded for the course.

CX 3805. Special Topics in Computational Science and Engineering. 5 Credit Hours.
Course topics will vary. This course number will be used to prototype new courses and/or offer courses on topics of timely interest. The final digit in the course number indicates the number of units offered awarded for the course.

CX 3XXX. CSE Elective. 1-21 Credit Hours.

CX 4010. Computational Problem Solving for Scientists and Engineers. 3 Credit Hours.
Computing principles, computer archietecture, algorithms and data structures; software development, parallelism. No credit for graduate students or undergraduates in Computer Science or Computational Media.

CX 4140. Computational Modeling Algorithms. 3 Credit Hours.
Design, analysis and implementation of algorithms for modeling natural and engineered systems; algorithm experimentation, and optimization.

CX 4220. Introduction to High Performance Computing. 3 Credit Hours.
Design of algorithms and software for high performance computing platforms used in computational science and engineering. Topics include parallelism, locality, machine architectures, and programming.

CX 4230. Computer Simulation. 3 Credit Hours.
Algorithms and techniques for creating computer simulations and their realization in software.

CX 4232. Simulation and Military Gaming. 3 Credit Hours.
Creation and use of modeling and simulation tools to analyze and train students regarding strategic events in international relations.

CX 4236. Distributed Simulation. 3 Credit Hours.
Algorithms and techniques used to execute simulations on parallel/distributed computing platforms. Simulations for analysis, virtual environments, and computer gaming.

CX 4240. Introduction to Computing for Data Analysis. 3 Credit Hours.
Computational techniques needed for data analysis; programming, accessing databases, multidimensional arrays, basic numerical computing, and visualization; hands-on applications and case studies.

CX 4242. Data and Visual Analytics. 3 Credit Hours.
Introduction to the analysis of complex data; theory, applications and practical case studies.

CX 4640. Numerical Analysis I. 3 Credit Hours.
Introduction to numerical algorithms for some basic problems in computational mathematics. Discussion of both implementation issues and error analysis.

CX 4641. Numerical Analysis II. 3 Credit Hours.
Introduction to the numerical solution of initial and boundary value problems in differential equations.

CX 4777. Introduction to Parallel and Vector Scientific Computing. 3 Credit Hours.
Scientific computational algorithms on vector and parallel computers. Speed-up and algorithm complexity, interprocess communication, synchronization, modern algorithms for linear systems, programming techniques, code optimization.

CX 4801. Special Topics in Computational Science and Engineering. 1 Credit Hour.
Course topics will vary. This course number will be used to prototype new courses and/or offer courses on topics of timely interest. The final digit in the course number indicates the number of units offered awarded for the course.

CX 4802. Special Topics in Computational Science and Engineering. 2 Credit Hours.
Course topics will vary. This course number will be used to prototype new courses and/or offer courses on topics of timely interest. The final digit in the course number indicates the number of units offered awarded for the course.

CX 4803. Special Topics in Computational Science and Engineering. 3 Credit Hours.
Course topics will vary. This course number will be used to prototype new courses and/or offer courses on topics of timely interest. The final digit in the course number indicates the number of units offered awarded for the course.

CX 4804. Special Topics in Computational Science and Engineering. 4 Credit Hours.
Course topics will vary. This course number will be used to prototype new courses and/or offer courses on topics of timely interest. The final digit in the course number indicates the number of units offered awarded for the course.

CX 4805. Special Topics in Computational Science and Engineering. 5 Credit Hours.
Course topics will vary. This course number will be used to prototype new courses and/or offer courses on topics of timely interest. The final digit in the course number indicates the number of units offered awarded for the course.

CX 4893. Special Topics. 3 Credit Hours.
Special Topics for CX (lecture + lab).

CX 4903. Special Problems in Computational Science and Engineering. 3 Credit Hours.
An investigation of significant areas of computational science and engineering. Guided study and research.

CX 4XXX. CSE Elective. 1-21 Credit Hours.

Professional Practive (DOPP)

DOPP 2001. Preparation for Work in a Global Economy. 1 Credit Hour.
Preparation for work in a global economy. May be used as free elective credit with departmental approval.

Earth and Atmospheric Sciences (EAS)

EAS 1600. Introduction to Environmental Science. 4 Credit Hours.
Introduction to environmental field science. Case study approach. Exposure to basic field equipment and techniques, analysis of data.

EAS 1601. Habitable Planet. 4 Credit Hours.
Introduction to the origin and evolution of Planet Earth, creation of the universe and the elements, early history of Earth, radioisotope geochemistry and the timing of events in the universe, the galaxy, and on Earth. Formation of the atmosphere and oceans. Climate.

EAS 1XXX. Earth and Atmospheric Sciences Elective. 1-21 Credit Hours.

EAS 2420. Environmental Measures of Urban and Regional Change. 3 Credit Hours.
Identify and quantify nature's physical and chemical contributions to human-made urban environments, and measure the impacts of urban area feedback on these natural systems.

EAS 2551. Introduction to Meteorological Analysis. 1 Credit Hour.
An introduction to analysis of forecasting data and moel output.

EAS 2600. Earth Processes. 4 Credit Hours.
An introduction to earth materials and processes.

EAS 2602. Earth Through Time. 3 Credit Hours.
Dynamic processes affecting the Earth system on all time scales.

EAS 2655. Quantitative Techniques in Earth and Atmospheric Sciences. 3 Credit Hours.
Integrated course in mathematical, physical, and computing techniques for applications in earth and atmospheric sciences.

EAS 2694. Internship Assistantship. 1-21 Credit Hours.
Earth & Atmospheric Sciences Undergraduate Internship for pay for freshmen and sophomores, by permit only. The internship experience must be at a unit or agency approved by the School of Earth & Atmospheric Sciences.

EAS 2695. Undergraduate Internship. 1-21 Credit Hours.
Earth & Atmospheric Sciences Undergraduate Internship for credit for freshmen and sophomores, by permit only. The internship experience must be at a unit or agency approved by the School of Earth & Atmospheric Sciences.

EAS 2698. Research Assistantship. 1-12 Credit Hours.

EAS 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

EAS 2750. Physics of the Weather. 3 Credit Hours.
An introductory treatment of the application of the basic physical laws to the understanding of weather phenomena. Crosslisted with PHYS 2750.

EAS 2801. Special Topics. 1 Credit Hour.

EAS 2802. Special Topics. 2 Credit Hours.

EAS 2803. Special Topics. 3 Credit Hours.

EAS 2804. Special Topics. 4 Credit Hours.

EAS 2900. Special Problems. 1-21 Credit Hours.

EAS 2XXX. Earth and Atmospheric Sciences Elective. 1-21 Credit Hours.

EAS 3110. Energy, Environment, and Society. 3 Credit Hours.
This course analyzes the path towards alternative energy infrastructures for the 21st century with careful consideration of economic, environmental, technological, and political factors.

EAS 3603. Thermodynamics of Earth Systems. 3 Credit Hours.
Introduction to the principles of equilinrium thermodynamics and physical chemistry with applications to the atmosphere, ocean, and solid earth.

EAS 3610. Introduction to Geophysics. 3 Credit Hours.
An introduction to visualizing and understanding earth history, structure, and dynamics through geophysical methods including seismology, gravity, magnetism, heat flow, geochronology, and geodesy.

EAS 3620. Geochemistry. 4 Credit Hours.
A quantitative treatment of geochemical processes in the Earth and natural waters, with emphasis on chemical reactions among atmospheric gases, minerals, and aqueous solutions.

EAS 3803. Special Topics. 3 Credit Hours.

EAS 3XXX. Earth and Atmospheric Sciences Elective. 1-21 Credit Hours.

EAS 4110. Resources, Energy and the Environment. 3 Credit Hours.
Learn about the science behind the nature, occurrence and extraction of earth resources used by humans and the environmental impacts of that use.

EAS 4200. Structural Geology and Continuum Mechanics. 4 Credit Hours.
Structural geology and continuum mechanics for scientists and civil engineers. Stress and strain in rocks; faults, joints, and folds; basic field mapping; laboratory exercises.

EAS 4205. Geomorphology. 4 Credit Hours.
Overview of the mechanical, chemical, and biological processes that shape topography.

EAS 4220. Environmental Geochemistry. 3 Credit Hours.
An exploration of the chemical, biological, and geological processes controlling the distribution of chemical nutrients and pollutants in aquatic and soil environments.

EAS 4221. Environmental Geochemistry Lab. 1 Credit Hour.
Lab and field exploration of the chemical, biological, and geological processes controlling the distribution of chemical nutrients and pollutants in aquatic and soil environments.

EAS 4224. Mineral Surface Geochemistry. 3 Credit Hours.
Fundamental principles concerning mineral surface properties, element distribution at the mineral-water interface and analytical techniques relevant to interfacial reactions.

EAS 4300. Introduction to Physical and Chemical Oceanography. 3 Credit Hours.
Chemistry and physics of the ocean. Distributions of temperature, salinity, and density. Equations of state and motion. Surface and deep-water circulation. Waves and tides. Composition of seawater: dissolved sales, gases, and nutrients. Biological processes. Marine sediments.

EAS 4305. Physical and Chemical Oceanography. 3 Credit Hours.
Study of the dynamics of large-scale ocean circulation, air-sea interaction and their roles in biogeochemical cycling of carbon and nutrients.

EAS 4312. Geodynamics. 3 Credit Hours.
Quantitative discussion of dynamic processs in the solid Earth; lithospheric dynamics, continuum mechanics, lithospheric flexure and elasticity, heat transfer, viscous rheology, fluid mechanics, and earthquake dynamics. Credit not allowed for both EAS 4312 and EAS 6312.

EAS 4313. Tectonics. Climate, and Landscape Evolution. 3 Credit Hours.
Introduction to the interactions and feedbacks between tectonics and climate that act to shape landscapes. Includes field- and computer-based data collection and analysis. Credit not allowed for both EAS 4313 and EAS 6313.

EAS 4314. Seismology. 3 Credit Hours.
Introduction to elastic wave propagation, and studies of the solid Earth's interior and earthquake source from seismic waves. Credit not allowed for both EAS 4314 and EAS 6314.

EAS 4315. Geofluids. 3 Credit Hours.
This course focuses on the fundamental concepts of fluid dynamics merged with geophysical applications.

EAS 4316. Earthquake Physics. 3 Credit Hours.
Fundamental physics of processes that control fault slips and earthquakes with a focus on the latest emerging research topics in the field.

EAS 4331. Physical Volcanology. 3 Credit Hours.
This class examines the dynamics and thermodynamics of planetary volcanism. The course material covers the generation and transport of magma in the mantle and crust, and the fluid dynamics of eruptions and their impact on the landscape and atmosphere. Credit not allowed for both EAS 4331 and EAS 6331.

EAS 4350. Paleoclimatology and Paleoceanography. 3 Credit Hours.
This course will explore the history of the Earth's climate, covering methods for reconstructing past climate and the mechanisms behind these climate changes.

EAS 4360. Space Physics and Space Instrumentation. 3 Credit Hours.
This course will explore the interaction of the solar wind with the Earth's magnetosphere using a combination spacecraft observations and fundamental plasma physics. Credit not allowed for both EAS 4360 and EAS 6360.

EAS 4370. Physics of Planets. 3 Credit Hours.
In this course we will study the forces and influences that determine the composition, structure and evolution of the planets in our solar system.

EAS 4375. Earth and Planetary Materials. 3 Credit Hours.
Fundamental principles and applications of mineralogy and petrology for understanding the composition of surface and subsurface materials on Earth and other planetary bodies.

EAS 4380. Land Remote Sensing. 3 Credit Hours.
Techniques for making remote measurements of the composition, morphology, and thermophysical properties of solid surfaces on Earth and other planetary bodies.

EAS 4410. Climate and Global Change. 3 Credit Hours.
The physics behind the climate and its potential changes, as well as an introduction to the policy issues in global change.

EAS 4420. Environmental Field Methods. 4 Credit Hours.
Semester-long focus on single environmental project in the local area. Chemical and physical techniques for parameterizing environmental problems, data analysis, report writing, and interpretation of results in societal context.

EAS 4430. Remote Sensing and Data Analysis. 3 Credit Hours.
Introduction to the remote sensing of the atmosphere and the Earth. Laboratory examples of data and image analysis for remote sensing applications.

EAS 4450. Synoptic Meteorology. 3 Credit Hours.
A description of physical and mathematical procedures used in weather forecasting. Students will practice forecasting.

EAS 4460. Satellite and Radar Meteorology. 3 Credit Hours.
Interpretation of satellite and radar data for meteorological forecasting based on understanding radiative transfer and the resulting strengths and limitations of the imagery.

EAS 4470. Large-scale Atmospheric Circulations. 3 Credit Hours.
Structure and dynamics of phenomena including weather regimes, storm tracks, El Nino-Southern Oscillations, teleconnections, monsoons, Arctic Oscillation, stratospheric polar vortex, and stratosphere-troposphere coupling.

EAS 4480. Environmental Data Analysis. 3 Credit Hours.
Data Analysis methods used in environmental research are taught through examples. Students learn to implement these methods to areas of their own interests.

EAS 4510. Exploration Geophysics. 4 Credit Hours.
Methods of exploration geophysics, including refraction and reflection seismology, resistivity, gravity, magnetics, and ground penetrating radar. Includes laboratory work and introduction to operation of field equipment.

EAS 4515. Fluids in the Earth's Crust I. 3 Credit Hours.
Fundamentals of porosity and permeability in soils, sediments, and crystalline rocks; basic physics of fluid flow through interconnected pore spaces and cracks; introductory analysis of fluid flow as an agent of heat and chemical transport in geological systems.

EAS 4520. Seismic Methods in Exploration Geophysics. 3 Credit Hours.
A study of seismic reflection exploration methods and theory. Examples are taken from oil industry exploration and production and near-surface environmental imaging.

EAS 4525. Weather Risk and Catastrophe Modeling. 3 Credit Hours.
Overview of the physics and dynamics behind different types of hazardous weather and the mathematical tools to model the risks associated with these events.

EAS 4602. Biogeochemical Cycles. 3 Credit Hours.
An investigation of global change focusing on the chemical, physical, geological, and biological processes that cycle the elements through the Earth system.

EAS 4610. Earth System Modeling. 3 Credit Hours.
An introduction to computer modeling in Earth system science.

EAS 4625. Water Quality Modeling. 3 Credit Hours.
Gain hands-on experience using geochemical software and understanding governing geochemical principles pertaining to transformation of contaminants and other subsurface species through case studies.

EAS 4630. Physics of the Earth. 3 Credit Hours.
Introduction to methods and observational data used to determine solid Earth structure and to understand the dynamical processes driving surface deformation and plate tectonics.

EAS 4641. Atmospheric Chem Lab. 1 Credit Hour.
A hands-on laboratory course in which students will learn basic concepts and techniques used by atmospheric chemists including analysis, data quality and experimental design.

EAS 4651. Practical Internship. 3 Credit Hours.
Faculty-supervised and approved independent internship, employment, or research project related to earth and atmospheric sciences.

EAS 4655. Atmospheric Dynamics. 3 Credit Hours.
An introduction to the atmospheric physical and dynamic processes that control weather and climate.

EAS 4656. Atmospheric Dynamics Practicum. 1 Credit Hour.
Students learn to apply meteorological analysis tools to atmospheric observations to interpret the structure and dynamics of historical and real-time weather events.

EAS 4670. Atmospheric Dynamics II. 3 Credit Hours.
This course emphasizes physical concepts and analytic techniques for solving problems in atmospheric instabilities and wave dynamics at various temporal and spatial scales.

EAS 4694. Internship Assistantship. 1-21 Credit Hours.
Earth & Atmospheric Sciences Undergraduate Internship for pay for junior and seniors, by permit only. The internship experience must be at a unit or agency approved by the School of Earth & Atmospheric Sciences.

EAS 4695. Undergraduate Internship. 1-21 Credit Hours.
Earth & Atmospheric Sciences Undergraduate Internship for credit for juniors and seniors, by permit only. The internship experience must be at a unit or agency approved by the School of Earth & Atmospheric Sciences.

EAS 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

EAS 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

EAS 4740. Atmospheric Chemistry Laboratory. 3 Credit Hours.
This course provides a general chemical description of the Earth's atmospheric system with a major focus on the two lowest layers of the atmosphere, i.e., the troposphere and the stratosphere. Crosslisted with CHEM 4740.

EAS 4795. Groundwater Hydrology. 3 Credit Hours.
Dynamics of flow and solute transport in groundwater, including theory, implementation, and case studies. Crosslisted with CEE 4795.

EAS 4801. Special Topics. 1 Credit Hour.

EAS 4802. Special Topics. 2 Credit Hours.

EAS 4803. Special Topics. 3 Credit Hours.

EAS 4804. Special Topics. 4 Credit Hours.

EAS 4813. Special Topics. 3 Credit Hours.
Special Topics in Earth and Atmospheric Sciences.

EAS 4814. Special Topics-Lab. 4 Credit Hours.

EAS 4821. Special Topics. 1 Credit Hour.
Special Topics in EAS (1-credit hour supervised lab).

EAS 4900. Special Problems. 1-21 Credit Hours.

EAS 4XXX. Earth and Atmospheric Sciences Elective. 1-21 Credit Hours.

EAS 6000. Intro Research & Ethics. 1 Credit Hour.
Identify and discuss ethical challenges that will be confronted in research, and give an overview of the research areas of the faculty in EAS.

EAS 6053. Preparing Future Faculty. 1 Credit Hour.
A guide to a career in academia for scientists. Learn about getting a faculty position, establishing a successful research.

EAS 6111. The Earth System. 2 Credit Hours.
Exploration of processes linking the Earth and atmosphere.

EAS 6120. Environmental Field Methods. 4 Credit Hours.
Environmental site characterization through a field-based project that advances student's research. Theory, field data acquisition, and data fusion using geochemical, geophysical, hydrologic, and related methods.

EAS 6121. Modeling and Computer Programming for Geosciences. 3 Credit Hours.
This course gives students first-hand experience on the development process of problem solving in Earth and Atmospheric Sciences from mathematically describing a problem to solving it by parallel programming on a high performance computer.

EAS 6122. Biogeochemical Cycles. 3 Credit Hours.
A multidisciplinary exploration of the chemical, physical, geological, and biological processes that cycle the nutrient elements through the Earth system and thereby maintain a habitable planet.

EAS 6124. Principles of Oceanography. 3 Credit Hours.
Chemistry and physics of the ocean. Distributions of temperatures, salinity, and density. Equations of state and motion. Surface and deep-water circulation, waves, and tides. Composition of seawater: dissolved salts, gases, and nutrients. Biological processes. Marine sediments.

EAS 6125. Water Quality Modeling. 3 Credit Hours.
Gain hands-on experience using geochemical software and understanding governing geochemical principles pertaining to transformation of contaminants and other subsurface species through case studies.

EAS 6128. Fluids in the Earth's Crust. 3 Credit Hours.
Advanced treatment of fluid flow, heat transfer, and reactive transport in porous and cracked rocks; stability of flow; double-diffusive systems; evolution of permeability in geologic systems; introduction to multiphase flow.

EAS 6130. Earth System Modeling. 3 Credit Hours.
An introduction to computer modeling in earth system science.

EAS 6131. Ocean Modeling. 3 Credit Hours.
Developing and using ocean models from the simple shallow water to the full primitive equation model. Includes hands-on programming.

EAS 6132. Introduction to Climate Change. 3 Credit Hours.
The climate of the Earth, its radiation budget, greenhouse gases and their sources and sinks, potential changes due to anthropogenic activities, detection of climate changes.

EAS 6133. Marine Ecosystem Modeling. 3 Credit Hours.
Modeling population dynamics in the context of ocean circulation. Numerical techniques and simulation development.

EAS 6134. Inverse Methods and Time Series Analysis in Earth and Atmospheric Sciences. 3 Credit Hours.
Theory of data acquisition, time series analysis, and discrete inverse theory, with applications in the earth and atmospheric sciences.

EAS 6135. Introduction to Complex Environmental Systems. 3 Credit Hours.
Introduction to the concepts of environmental complexity through the inter-relationships between natural, human, and built systems.

EAS 6136. Paleoclimatology and Paleoceanography. 3 Credit Hours.
This course will explore the history of the Earth's climate, covering methods for reconstructing past climate and the mechanisms behind these climate changes.

EAS 6140. Thermodynamics of Atmospheres and Oceans. 3 Credit Hours.
The instabilities and flows created by exchanges of heat.

EAS 6142. Atmospheric Radiative Tranfser. 3 Credit Hours.
Fundamentals of the interaction of electromagnetic radiation with atmospheric constituents, including absorption and scattering processes by the atmospheric gases, aerosols, and clouds.

EAS 6145. Remote Sensing of the Atmosphere and Oceans. 3 Credit Hours.
Provides a foundation for understanding the physical principles of remote sensing and its applications to the study of atmospheric gases, clouds, and ocean surfaces.

EAS 6155. Advanced Geophysical Fluid Dynamics. 3 Credit Hours.
Fundamental mathematical tools for graduate students interested in Geophysical Fluid Dynamics (GFD) and related disciplines.

EAS 6200. Environmental Geochemistry. 3 Credit Hours.
An exploration of the chemical, biological, and geological processes controlling the distribution of chemical nutrients and pollutants in aquatic and soil environments.

EAS 6201. Environmental Geochemistry Lab. 1 Credit Hour.
Lab and field exploration of the chemical, biological, and geological processes controlling the distribution of chemical nutrients and pollutants in aquatic and soil environments.

EAS 6211. Geochemical Thermodynamics. 3 Credit Hours.
Fundamental principles of chemical equilibria in geochemical systems with emphasis on solution properties and mineral water equilibria.

EAS 6212. Geochemical Kinetics. 3 Credit Hours.
Fundamental principles of biogeochemical kinetics and mathematical treatment of coupled transport and reaction in natural environments. Interpretation of field and experimental data using kinetic theory.

EAS 6214. Aqueous Geochemistry. 3 Credit Hours.
Chemical processes that regulate compositions of natural waters at or near the Earth's surface, with emphasis on quantitative calculations of acid-base, solubility, and redox equilibria.

EAS 6216. Isotope Geochemistry. 3 Credit Hours.
Biogeochemical significance of nuclear isotopes, both radioactive and stable.

EAS 6224. Mineral Surface Geochemistry. 3 Credit Hours.
Fundamental principles concerning mineral surface properties, element distribution at the mineral-water interface, and analytical techniques relevant to interfacial reactions.

EAS 6240. Organic Geochemistry. 3 Credit Hours.
Origin and transformation of organic matter in the Earth's environments, with emphasis on properties and reactions of highly complex mixtures such as humic substances.

EAS 6305. Physical and Chemical Oceanography. 3 Credit Hours.
Study of the dynamics of large-scale ocean circulation, air-sea interaction and their roles in biogeochemical cycling of carbon and nutrients.

EAS 6311. Physics of the Earth. 3 Credit Hours.
Physics of the Earth's interior. Composition and structure of core, mantle, crust. Introduction to seismic wave propagation, gravitational, geomagnetic, and temperature fields.

EAS 6312. Geodynamics. 3 Credit Hours.
Quantitative discussion of dynamical processes in the solid Earth; viscous flow, glacial rebound, fluid dynamical instabilities, thermal convection; lithospheric dynamics; evolution of the core.

EAS 6313. Tectonics, Climate, and Landscape Evolution. 3 Credit Hours.
Introduction to the interactions and feedbacks between tectonics and climate that act to shape landscapes. Includes field- and computer-based data collection and analysis. Credit not allowed for both EAS 6313 and EAS 4313.

EAS 6314. Seismology. 3 Credit Hours.
The propagation of seismic waves, the description of earthquake motion, and evaluation of earthquake damage. Examples provide experience in the interpretation of seismic data.

EAS 6315. Geofluids. 3 Credit Hours.
This course focuses on the fundamental concepts of fluid dynamics merged with geophysical applications.

EAS 6316. Earthquake Physics. 3 Credit Hours.
Fundamental physics of processes that control fault slips and earthquakes with a focus on the latest emerging research topics in the field.

EAS 6320. Structural Geology and Continuum Mechanics. 4 Credit Hours.
Structural geology and continuum mechanics for scientists and civil engineers. Stress and strain in rocks; faults, joints, and folds; basic field mapping, laboratory exercises.

EAS 6325. Geomorphology. 4 Credit Hours.
Overview of the mechanical, chemical, and biological processes that shape the topography.

EAS 6331. Physical Volcanology. 3 Credit Hours.
This class examines the dynamics and thermodynamics of planetary volcanism. The course material covers the generation and transport of magma in the mantle and crust, and the fluid dynamics of eruptions and their impact on the landscape and atmosphere. Credit not allowed for both EAS 6331 and EAS 4331.

EAS 6333. Field Methods in Volcanic Terrain. 3 Credit Hours.
A field based course to connect process-based models and field observations related to volcanic, eruptions, subsurface magma interaction, and crustal heat flow and tectonics.

EAS 6360. Space Physics and Space Instrumentation. 3 Credit Hours.
This course will explore the interaction of the solar wind with the Earth's magnestophere using a combination spacecraft observation and fundamental plasma physics. Credit not allowed for both EAS 6360 and EAS 4360.

EAS 6370. Physics of Planets. 3 Credit Hours.
In this course we will study the forces and influences that determine the compostition, structure, and evolution of the planets of our solar system.

EAS 6375. Earth and Planetary Materials. 3 Credit Hours.
Fundamental principles and application of mineralogy and petrology for understanding the composition of surface and subsurface materials on Earth and other planetary bodies.

EAS 6380. Land Remote Sensing. 3 Credit Hours.
Techniques for making remote measurements of the composition, morphology, and thermophysical properties of solid surfaces on Earth and other planetary bodies.

EAS 6401. Introduction to Atmospheric Chemistry. 2 Credit Hours.
Introduction to basic chemical principles related to chemical processes in the atmosphere.

EAS 6405. Introduction to Atmospheric and Aqueous Chemistry. 3 Credit Hours.
An introduction to the basics of atmospheric and aqueous chemistry for first semester graduate students. The class goes over photochemistry, thermodynamics, kinetics, redox systems, carbon chemistry, radioactive and stable isotopes, and gas/solid reactions.

EAS 6410. Atmospheric Chemistry. 3 Credit Hours.
Application of fundamental principles of chemistry to understanding the critical factors controlling the levels and distributions of atmospheric trace gases and their variation in time.

EAS 6412. Introduction to Physical Meteorology. 3 Credit Hours.
Application of the fundamental principles of thermodynamics to the atmosphere; including hydrostatic equilibrium and static stability, derivation of Claussius-Clapeyron Equation, cloud microphysics, radiative transfer, and the Earth's energy budget.

EAS 6420. Introduction to Principles of Atmospheric Chemical. 4 Credit Hours.
Introduction to the mechanical, electrical, and optical aspects of modern instrumentation used in atmospheric chemical research.

EAS 6430. Experimental Methods in Air Quality. 3 Credit Hours.
Presents experimental and field methods through a focus on measurements of atmospheric gases and particulates associated with poor air quality. Experiments will involve laboratory measurements and an air quality filed experiment on the order of one week duration.

EAS 6490. Advanced Environmental Data Analysis. 3 Credit Hours.
A unified view of the theories and applications underlying the statistical analysis of environmental data in the space, time and spectral domain.

EAS 6500. Climate and Global Change. 3 Credit Hours.
The physics behind the climate and its potential changes, as well as an introduction to the policy issues in global change.

EAS 6501. Introduction to Atmospheric Dynamics. 2 Credit Hours.
Introduction to the basic fundamental fluid dynamics that control atmospheric motions.

EAS 6502. Introductory Fluid Dynamics and Synoptic Meteorology. 3 Credit Hours.
Fundamental principles of atmospheric fluid dynamics, analysis of meteorological codes, weather data and patterns, and numerical weather prediction.

EAS 6512. Dynamic Meteorology. 3 Credit Hours.
An introduction to the use of geophysical fluid dynamics in describing and modeling the atmosphere.

EAS 6522. Dynamics of the Tropical Atmosphere and Oceans. 3 Credit Hours.
Explores the dynamics of the tropical atmosphere and ocean and how they interact to produce climatic features such as the monsoons, El Nino, and La Nina.

EAS 6525. Weather Risk and Modeling. 3 Credit Hours.
Overview of the physics and dynamics behind different types of hazardous weather and the mathematical tools to model the risks associate with these events.

EAS 6532. Large-scale Atmospheric Circulations. 3 Credit Hours.
Structure and dynamics of phenomena including weather regimes, storm tracks, El Nino-Southern Oscillation, teleconnections, monsoons, Artic Oscillation, stratospheric polar vortex, and stratosphere-troposphere coupling.

EAS 6670. Atmospheric Dyanmics II. 3 Credit Hours.
This course emphasizes physical concepts and analytic techniques for solving problems in atmospheric instabilities and wave dynamics at various temporal and spatial scales.

EAS 6672. Ocean Dynamics. 3 Credit Hours.
An advanced class on the ocean circulation as a dynamical system to understand the basic equations governing it, together with its variability.

EAS 6751. Physical Properties and Rheology of Rocks. 3 Credit Hours.
Structure, physical properties, and rheology of minerals and rocks with applications to engineering structures and natural phenomena in the Earth. Fundamentals of rock mechanics and crack propagation. Crosslisted with CEE 6751.

EAS 6761. Contaminated Sediment Geochemistry. 3 Credit Hours.
Acquaints students with fate of major pollutants, nutrients, organic compounds such as pesticides, PAH's, and trace metals in sedimentary systems. Crosslisted with CEE 6761.

EAS 6765. Geomicrobiology. 3 Credit Hours.
Interactions between microorganisms and the geosphere; microbial energetics and genetics; geochemical controls on microbial diversity and activity; redox and acid-base balances; biogeochemical cycles; evolution. Crosslisted with BIOL 6765.

EAS 6790. Air Pollution Physics and Chemistry. 3 Credit Hours.
Interaction to the physical and chemical processes affecting the dynamics and fate of air pollutants at the local, regional, and global scales. Particular emphasis is on tropospheric pollutant chemistry and transport. Crosslisted with CEE 6790.

EAS 6792. Air Pollution Meteorology and Chemistry. 3 Credit Hours.
Air pollution history, atmospheric stability and boundary layer dynamics, atmospheric dispersion, atmospheric transport, air pollution modeling. Crosslisted with CEE 6792.

EAS 6793. Atmospheric Boundary Layer. 3 Credit Hours.
Structure and dynamics of atmospheric boundary layers. Introduction to turbulence and turbulent transport. Crosslisted with CEE 6793.

EAS 6794. Atmospheric Chemical Modeling. 3 Credit Hours.
Application of modern numerical methods to the prediction of atmospheric chemical and physical compositions; specific applications using computer models developed by the students are included. Crosslisted with CEE 6794.

EAS 6795. Atmospheric Aerosols. 3 Credit Hours.
Chemical and physical properties of natural and anthropogenic aerosols. Sources, transport, transformation, and fate of primary/secondary, organic/inorganic, atmospheric semi-volatiles and aerosols. Crosslisted with CEE 6795.

EAS 6XXX. Earth and Atmospheric Sciences Elective. 1-21 Credit Hours.

EAS 7000. Master's Thesis. 1-21 Credit Hours.

EAS 7999. Preparation for Ph.D. Qualifying Exam. 1-21 Credit Hours.

EAS 8001. Seminar. 1 Credit Hour.
A forum for graduate students in earth and atmospheric sciences to present and discuss topics related to their research interests.

EAS 8011. Seminar. 1 Credit Hour.
A forum for graduate students in earth and atmospheric sciences to present and discuss topics related to their research interests.

EAS 8012. Seminar. 2 Credit Hours.
A forum for graduate students in earth and atmospheric sciences to present and discuss topics related to their research interests.

EAS 8013. Seminar. 3 Credit Hours.
A forum for graduate students in earth and atmospheric sciences to present and discuss topics related to their research interests.

EAS 8801. Special Topics. 1 Credit Hour.

EAS 8802. Special Topics. 2 Credit Hours.

EAS 8803. Special Topics. 3 Credit Hours.

EAS 8804. Special Topics. 4 Credit Hours.

EAS 8805. Special Topics. 5 Credit Hours.

EAS 8806. Special Topics. 6 Credit Hours.

EAS 8811. Special Topics. 1 Credit Hour.
Special Topics in EAS (1-credit hour supervised lab)

EAS 8813. Special Topics. 3 Credit Hours.
Special Topics in Earth and Atmospheric Sciences.

EAS 8821. Special Topics. 1 Credit Hour.
Special Topics in EAS (1-credit hour supervised lab).

EAS 8823. Special Topics with a Laboratory. 3 Credit Hours.

EAS 8824. Special Topics with a Laboratory. 4 Credit Hours.

EAS 8825. Special Topics with a Laboratory. 5 Credit Hours.

EAS 8826. Special Topics-Lab. 4 Credit Hours.

EAS 8901. Special Problems. 1-21 Credit Hours.

EAS 8902. Special Problems. 1-21 Credit Hours.

EAS 8903. Special Problems. 1-21 Credit Hours.

EAS 8904. Special Problems. 1-21 Credit Hours.

EAS 8997. Teaching Assistantship. 1-9 Credit Hours.

EAS 8998. Research Assistantship. 1-9 Credit Hours.

EAS 8999. Preparation for Doctoral Dissertation. 1-21 Credit Hours.

EAS 9000. Doctoral Thesis. 1-21 Credit Hours.

Electrical & Computer Engr (ECE)

ECE 1010. Introduction to ECE Design. 2 Credit Hours.
An introduction to basic concepts useful for all areas of Electrical and Computer Engineering. Focus on hands-on, team-based activities using robotics.

ECE 1100. ECE Discovery Studio. 1 Credit Hour.
Students will explore ECE curriculum threads and opportunities available during the undergraduate experience while navigating the early career planning process.

ECE 1801. Special Topics. 1 Credit Hour.

ECE 1802. Special Topics. 2 Credit Hours.

ECE 1803. Special Topics. 3 Credit Hours.

ECE 1804. Special Topics. 4 Credit Hours.

ECE 1805. Special Topics. 5 Credit Hours.

ECE 1811. Special Topics. 1 Credit Hour.

ECE 1812. Special Topics. 2 Credit Hours.

ECE 1813. Special Topics. 3 Credit Hours.

ECE 1814. Special Topics. 4 Credit Hours.

ECE 1815. Special Topics. 5 Credit Hours.

ECE 1871. Special Topics. 1 Credit Hour.
Special Topics for Electrical and Computer Engineering.

ECE 1881. Special Topics. 1 Credit Hour.

ECE 1882. Special Topics. 2 Credit Hours.

ECE 1883. Special Topics. 3 Credit Hours.

ECE 1884. Special Topics. 4 Credit Hours.

ECE 1891. Special Topics. 1 Credit Hour.

ECE 1892. Special Topics. 2 Credit Hours.

ECE 1893. Special Topics. 3 Credit Hours.

ECE 1894. Special Topics. 4 Credit Hours.

ECE 1900. Special Problems. 1-21 Credit Hours.

ECE 1901. Special Problems. 1-21 Credit Hours.

ECE 1902. Special Problems. 1-21 Credit Hours.

ECE 1903. Special Problems. 1-21 Credit Hours.

ECE 1XXX. Electrical and Computer Engineering Elective. 1-21 Credit Hours.

ECE 2001. ECE Seminar. 1 Credit Hour.
Speakers with diverse backgrounds and representing many different industries, professions, and institutions describe their experiences, entrepreneurial ventures, and research challenges.

ECE 2002. ECE Seminar. 1 Credit Hour.
Speakers with diverse backgrounds and representing many different industries, professions, and institutions describe their experiences, entrepreneurial ventures, and research challenges.

ECE 2003. ECE Seminar. 1 Credit Hour.
Speakers with diverse backgrounds and representing many different industries, professions, and institutions describe their experiences, entrepreneurial ventures, and research challenges.

ECE 2020. Digital System Design. 3 Credit Hours.
Computer system and digital design principles. Switch and gate design, Boolean algebra, number systems, arithmetic, storage elements. Datapath, memory organization, instruction set architecture, assembly language. Credit not allowed for both ECE 2020 and ECE 2030.

ECE 2025. Introduction to Signal Processing. 4 Credit Hours.
Introduction to signal processing for discrete-time and continuous-time signals. Filtering. Frequency response. Fourier Transform. Z Transform. Laboratory emphasizes computer-based signal processing. Credit not allowed for both ECE 2025 and ECE 2026.

ECE 2026. Introduction to Signal Processing. 3 Credit Hours.
Introduction to discrete-time signal processing and linear systems. Sampling theorem, filtering, frequency response, Discrete Fourier Transform, Z-Transform. Laboratory emphasizes computer-based signal processing. Credit not allowed for both ECE 2026 and ECE 2025.

ECE 2030. Introduction to Computer Engineering. 3 Credit Hours.
Computer system and digital design principles. Architectural concepts, software, Boolean algebra, number systems, combinational datapath elements, sequential logic, and storage elements. Design of DRAM control and I/O bus. Credit not allowed for both ECE 2030 and ECE 2020.

ECE 2031. Digital Design Laboratory. 2 Credit Hours.
Design and implementation of digital systems, including a team design project. CAD tools, project design methodologies, logic synthesis, and assembly language programming.

ECE 2035. Programming for Hardware/Software Systems. 4 Credit Hours.
Creation of complex execution and storage mechanisms, based on instruction set architecture, for software design including high-level programming languages and operating systems. Programming design projects. Credit not allowed for both ECE 2035 and ECE 3035.

ECE 2036. Engineering Software Design. 4 Credit Hours.
Object-oriented software methods for engineering applications. Numerical analysis methods; simulations and graphical presentation of simulation results; analysis of numerical precision. Programming projects. Credit not allowed for both ECE 2036 and ECE 3090.

ECE 2040. Circuit Analysis. 3 Credit Hours.
Basic concepts of DC and AC circuit theory and analysis.

ECE 2045. Practical Skills and Design. 1 Credit Hour.
This course teaches practical skills, such as soldering and prototyping, and introduces students to ECE design.

ECE 20X2. Transfer-Digital Des Lab. 2 Credit Hours.

ECE 20X3. Transfer-Digital Systems. 3 Credit Hours.

ECE 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

ECE 2699. Undergraduate Research. 1-12 Credit Hours.
Independent Research conducted under the guidance of a faculty member.

ECE 2801. Special Topics. 1 Credit Hour.

ECE 2802. Special Topics. 2 Credit Hours.

ECE 2803. Special Topics. 3 Credit Hours.

ECE 2804. Special Topics. 4 Credit Hours.

ECE 2805. Special Topics. 5 Credit Hours.

ECE 2811. Special Topics. 1 Credit Hour.

ECE 2812. Special Topics. 2 Credit Hours.

ECE 2813. Special Topics. 3 Credit Hours.

ECE 2814. Special Topics. 4 Credit Hours.

ECE 2815. Special Topics. 5 Credit Hours.

ECE 2871. Special Topics. 1 Credit Hour.

ECE 2881. Special Topics. 1 Credit Hour.

ECE 2882. Special Topics. 2 Credit Hours.

ECE 2883. Special Topics. 3 Credit Hours.

ECE 2884. Special Topics. 4 Credit Hours.

ECE 2891. Special Topics. 1 Credit Hour.

ECE 2892. Special Topics. 2 Credit Hours.

ECE 2893. Special Topics. 3 Credit Hours.

ECE 2894. Special Topics. 4 Credit Hours.

ECE 2900. Special Problems. 1-21 Credit Hours.

ECE 2901. Special Problems. 1-21 Credit Hours.

ECE 2902. Special Problems. 1-21 Credit Hours.

ECE 2903. Special Problems. 1-21 Credit Hours.

ECE 2XXX. Electrical and Computer Engineering Elective. 1-21 Credit Hours.

ECE 3005. Professional and Technical Communications for ECE. 1 Credit Hour.
Written, oral, and visual communication skills required by electrical and computer engineers. Prepares students for advanced communication tasks required in academic and professional settings.

ECE 3006. Co-Curricular Professional Communications for ECE. 0 Credit Hours.
This course documents student completion of ECE professional communications requirement through workshops, seminars, research projects, co/extra-curricular activities, etc.

ECE 3011. ECE Design Fundamentals. 2 Credit Hours.
This course teaches system-level design, including both software and hardware. Through activities and projects, students gain exposure to entrepreneurship, product lifecycle management, prototyping, and testing.

ECE 3020. Mathematical Foundations of Computer Engineering. 3 Credit Hours.
Fundamental concepts in discrete mathematics and their efficient realization via algorithms, data structures, computer programs, and hardware. Discussion of engineering and computational applications.

ECE 3025. Electromagnetics. 3 Credit Hours.
To present the laws and applications of electromagnetics.

ECE 3030. Physical Foundations of Computer Engineering. 3 Credit Hours.
Basic principles governing the physical realization of computing systems and their relationship to characteristics such as performance, energy, and robustness. Implementation technologies.

ECE 3035. Mechanisms for Computing Systems. 4 Credit Hours.
Computing system execution and storage mechanisms, starting with instruction set architecture and concluding with support for high level languages and operating systems. Credit not allowed for both ECE 3035 and ECE 2035.

ECE 3040. Microelectronic Circuits. 4 Credit Hours.
Basic concepts of microelectronic materials, devices, and circuits.

ECE 3043. Measurements, Circuits, and Microelectronics Laboratory. 2 Credit Hours.
Basic electronic test instrumentation. Elementary passive and active circuits using both discrete (diodes, bipolar junction transistors, MOSFETs) and integrated devices (operational amplifiers). Credit not allowed for both ECE 3043 and ECE 3041.

ECE 3050. Analog Electronics. 3 Credit Hours.
To present concepts of analysis and design of electronic circuits and systems. Biasing, small-signal analysis, frequency response, feedback amplifiers, active filters, non-linear op-amp applications, and oscillators.

ECE 3055. Computer Architecture and Operating Systems. 4 Credit Hours.
Core concepts of computer architecture and operating systems. Instruction set architectures (ISA), compiler/ISA relationships, pipelined datapaths. Memory hierarchy, memory management, and protection. Processes, threads, CPU scheduling, and associated techniques. Credit not allowed for both ECE 3055 and ECE 3056.

ECE 3057. Architecture, Systems, Concurrency and Energy in Computation. 3 Credit Hours.
Basic organizational principles of the major components of a processor - the core, memory hierarchy, I/O subsystem and basic operating system constructs that utilize them.

ECE 3058. Architecture, Systems, Concurrency, and Energy in Computation. 4 Credit Hours.
Basic organizational principles of the major components of a processor – the core, memory hierarchy, I/O subsystem and basic operating system constructs that utilize them.

ECE 3060. VLSI and Advanced Digital Design. 4 Credit Hours.
Advanced digital design issues in the context of VLSI systems. Introduction to a design methodology that encompasses the range from behavioral models to circuit simulation. Credit will not be awarded for ECE 3060 and ECE 3150.

ECE 3065. Electromagnetic Applications. 3 Credit Hours.
To present concepts in waveguiding and radiation, with application to microwaves, antennas, and optics. Credit will not be awarded for ECE 3065 and ECE 4350.

ECE 3070. Electromechanical and Electromagnetic Energy Conversion. 3 Credit Hours.
This course serves as an introduction to three-phase power systems, electromechanical energy conversion, and operating principles of electric machines.

ECE 3071. Modern Electric Energy Systems. 3 Credit Hours.
Non-renewable and renewable/sustainable energy sources. Processes, costs, and environmental impact of conversion into electric energy. Delivery and control of electric energy, electromechanical systems. Credit not allowed for both ECE 3071 and ECE 3072.

ECE 3072. Electrical Energy Systems. 3 Credit Hours.
Non-renewable and renewable/sustainable energy sources. Processes, costs, and environmental impact of conversion into electric energy. Delivery and control of electric energy, electromechanical systems. Credit not allowed for both ECE 3072 and ECE 3071.

ECE 3075. Random Signals. 3 Credit Hours.
Study of random variables and random processes for applications in electrical and computer engineering. Includes an introduction to statistical filtering, parameter estimation, Markov processes.

ECE 3076. Computer Communications. 3 Credit Hours.
Presents the basic concepts of computer communications network protocols.

ECE 3077. Introduction to Probability and Statistics for ECE. 3 Credit Hours.
Introduction to probability, random variables, distributions, estimation, confidence intervals, linear regression and other tools for describing and managing uncertainty in electrical and computer engineering.

ECE 3080. Semiconductor Devices for Computer Engineering and Telecommunication Systems. 3 Credit Hours.
To gain an understanding of the device needs for current and future computers, and fiber optic and wireless communication systems addressing the future needs of high- frequency, GHz-range, device operation.

ECE 3084. Signals and Systems. 3 Credit Hours.
Continuous-time linear systems and signals, their mathematical representations, and computational tools. Fourier and Laplace transforms, convolutions, input-output responses, stability.

ECE 3085. Introduction to Systems and Controls. 3 Credit Hours.
Theory of linear time-invariant systems for continuous and discrete time. Laplace and Z-Transforms. Transfer function and state space representations. Introduction to feedback control theory.

ECE 3150. VLSI and Advanced Digital Design. 4 Credit Hours.
Advanced digital design issues in the context of VLSI systems. Introduction to a design methodolgy that encompasses the range from architectural models to circuit simulation. Credit not awarded for ECE 3150 and ECE 3060.

ECE 3170. Cryptographic Hardware for Embedded Systems. 4 Credit Hours.
Introduction to cryptography and authentication from a hardware-centric perspective. Historic ciphers, symmetric and asymmetric encryption, and power analysis attacks are taught from a digital and VLSI design perspective.

ECE 3251. Optimization for Information Systems. 3 Credit Hours.
An introduction to the fundamentals of optimization with a focus on algorithms and applications in signal processing, control systems, machine learning, and robotics.

ECE 3300. Electromechanical and Electromagnetic Energy Conversion. 3 Credit Hours.
Introduction to three phase power systems, electromechanical energy conversion and operating principles of electric machines.

ECE 3400. Analog Electronics. 3 Credit Hours.
Analysis and design of electronic circuits and systems. Biasing, small-signal analysis, frequency response, feedback amplifiers, active filters, non-linear op-amp applications, and oscillators.

ECE 3450. Semiconductor Devices. 3 Credit Hours.
Properties of semiconductor devices. Applications in current and future computers, fiber optic and wireless communication systems. Future needs of high frequency, GHz-range, device operation.

ECE 3550. Feedback Control Systems. 3 Credit Hours.
Analysis and design of control systems. Laplace transforms, transfer functions, and stability. Feedback systems: tracking and disturbance rejection. Graphical design techniques.

ECE 3600. Computer Communications. 3 Credit Hours.
Basic concepts of computer communication network protocols.

ECE 3710. Circuits and Electronics. 2 Credit Hours.
An introduction to electric circuit elements and electronic devices and a study of circuits containing such devices.

ECE 3741. Instrumentation and Electronics Lab. 1 Credit Hour.
Basic analog and digital electronic circuits and principles. Techniques of electrical and electronic measurements with laboratory instruments.

ECE 3801. Special Topics. 1 Credit Hour.

ECE 3802. Special Topics. 2 Credit Hours.

ECE 3803. Special Topics. 3 Credit Hours.

ECE 3804. Special Topics. 4 Credit Hours.

ECE 3805. Special Topics. 5 Credit Hours.

ECE 3811. Special Topics. 1 Credit Hour.

ECE 3812. Special Topics. 2 Credit Hours.

ECE 3813. Special Topics. 3 Credit Hours.

ECE 3814. Special Topics. 4 Credit Hours.

ECE 3815. Special Topics. 5 Credit Hours.

ECE 3872. Special Topics. 2 Credit Hours.

ECE 3881. Special Topics. 1 Credit Hour.

ECE 3882. Special Topics. 2 Credit Hours.

ECE 3883. Special Topics. 3 Credit Hours.

ECE 3884. Special Topics. 4 Credit Hours.

ECE 3891. Special Topics. 1 Credit Hour.

ECE 3892. Special Topics. 2 Credit Hours.

ECE 3893. Special Topics. 3 Credit Hours.

ECE 3894. Special Topics. 4 Credit Hours.

ECE 3900. Special Problems. 1-21 Credit Hours.

ECE 3901. Special Problems. 1-21 Credit Hours.

ECE 3902. Special Problems. 1-21 Credit Hours.

ECE 3903. Special Problems. 1-21 Credit Hours.

ECE 3951. Undergraduate Research I. 1-21 Credit Hours.
Participation in an individual or group research project under the direction of a faculty member.

ECE 3952. Undergraduate Research II. 1-21 Credit Hours.
Participation in an individual or group research project under the direction of a faculty member. Requires a formal research report.

ECE 3XXX. Electrical and Computer Engineering Elective. 1-21 Credit Hours.

ECE 4001. Engineering Practice and Professionalism. 2 Credit Hours.
Technical tools and professional issues for engineering practice and early career development. Engineering ethics, design tools, financial and economic principles, project management, probabilistic and statistical techniques, and decision making. Credit not allowed for both ECE 4001 and ECE 4000.

ECE 4007. ECE Culminating Design Project. 4 Credit Hours.
Team-oriented culminating design project in electrical/ computer engineering, incorporating engineering standards and realistic constraints. Requires formal reports and group presentations. Credit not allowed for both ECE 4007 and ECE 4006.

ECE 4011. ECE Culminating Design Project I. 2 Credit Hours.
First semester of ECE culminating design sequence. Design tools, financial principles, project management, probabilistic and statistical techniques, team forming. Requires formal reports and group presentations.

ECE 4012. ECE Culminating Design Project II. 3 Credit Hours.
Second semester of ECE culminating design sequence. Team project in ECE incorporating engineering standards and realistic constraints. Requires formal reports and group presentations.

ECE 4013. ECE Culminating Design I. 1 Credit Hour.
First course in a culminating design sequence. Student teams design, build, test, document, demonstrate prototype system reflective of knowledge gained as an undergraduate engineering student.

ECE 4014. ECE Culminating Design 2. 2 Credit Hours.
Second course in a culminating design sequence. Student teams design, build, test, document, demonstrate prototype system reflective of knowledge gained as an undergraduate engineering student.

ECE 4015. ECE-Only Single-Semester Capstone Design. 3 Credit Hours.
A single-semester ECE culminating design experience forming ECE-only teams, proposing, prototyping, testing, demonstrating, formally presenting and documenting projects incorporating engineering standards and realistic constraints.

ECE 4043. Senior Analog Electronics Laboratory. 2 Credit Hours.
Experiments in analog electronics using discrete devices and off-the-shelf integrated circuits.

ECE 4053. Research Methods. 2 Credit Hours.
Course provides methods and practices for literature searching, reference management, and summary preparation. Coverage includes journals, conferences, theses, patents, grants, roadmaps, and companies.

ECE 4100. Advanced Computer Architecture. 3 Credit Hours.
Comprehensive coverage of the architecture and system issues that confront the design of high-performance workstation/PC computer architectures with emphasis on quantitative evaluation. Credit is not allowed for both ECE 4100 and any of the following courses: ECE 6100, CS 4290, CS 6290.

ECE 4110. Internetwork Programming. 4 Credit Hours.
Exploration of Internet implementation as a network of computing systems. Internetworking skills for design and implementation of hardware and software Internet products.

ECE 4112. Internetwork Security. 3 Credit Hours.
Hands-on experimentation and evaluation of internet security theory, principles, and practices. Laboratory component involves implementing both defensive and offensive security techniques. Credit not awarded for both ECE 4112 and ECE 4115.

ECE 4115. Introduction to Computer Security. 4 Credit Hours.
Introductory topics in computer security are presented with an emphasis on fundamental security primitives and current security challenges facing society. Credit not awarded for both ECE 4115 and ECE 4112.

ECE 4117. Introduction to Malware Reverse Engineering. 4 Credit Hours.
This course exposes students to an immersive, hands-on experience in the dissection and analysis of the code, structure, and functionality of malicious software.

ECE 4122. Advanced Programming Techniques for Engineering Applications. 3 Credit Hours.
Course covers a number of programming techniques for distributed and parallel computing and other advanced methods, such as multiprecision arithmetic and nonblocking I/O. Credit not awarded for ECE 4122 and ECE 6122.

ECE 4130. Advanced VLSI Systems. 4 Credit Hours.
An advanced treatment of VLSI systems analysis, design, and testing with emphasis on complex systems and how they are incorporated into a silicon environment. Credit is not allowed for both ECE 4130 and ECE 6130.

ECE 4147. Adv Malware Analysis. 3 Credit Hours.
This course covers advanced approaches for the analysis of malicious software and explores recent research and unsolved problems in software protection and forensics.

ECE 4150. Cloud Computing. 3 Credit Hours.
Cloud computing technologies, computation models, and applications, design methodologies for cloud applications, use of cloud-based languages and tools in developing advanced applications.

ECE 4156. Hardware-Oriented Security and Trust. 3 Credit Hours.
Fundamental concepts, foundation, and methodologies for the design of trustworthy circuits including protection of the hardware platform against tampering. Physical cloning of cryptographic VLSI circuits.

ECE 4180. Embedded Systems Design. 4 Credit Hours.
Processors, chipsets, busses, and I/O devices for high-ended embedded systems. Embedded operating systems; device drivers and applications for embedded systems.

ECE 4181. Embedded Computing Systems. 4 Credit Hours.
Algorithms and methodologies for the design of real-time, low-power embedded computing systems.

ECE 4252. Fundamentals of Machine Learning (FunML). 3 Credit Hours.
An introduction to the fundamentals and applications of Machine Learning. Students cannot receive credit for both ECE 4252 and CS 4641.

ECE 4258. Digital Image Processing. 3 Credit Hours.
An introduction to the Fundamentals of Image Processing.

ECE 4260. Random Signals and Applications. 3 Credit Hours.
Introduction to random signals and processes with emphasis on applications in ECE. Includes basic estimation theory, linear prediction, and statistical modeling.

ECE 4270. Fundamentals of Digital Signal Processing. 3 Credit Hours.
Introduction to digital signal processing. Sampling theorem, discrete-time Fourier transform. Power spectrum, discrete Fourier transform and the FFT algorithm, Z-transform, digital filter design and implementation.

ECE 4271. Applications of Digital Signal Processing. 4 Credit Hours.
Applications of DSP in speech, image processing, radar, pattern recognition, and adaptive filtering requiring working software implementations applied to the analysis of real signals.

ECE 4273. Design Synthesis of Application-specific Signal Processors. 3 Credit Hours.
Fundamentals of theory and practice of DSP chip design in VHDL. Exposure to tools and environments for chip design, simulation, and verification.

ECE 4320. Power System Analysis and Control. 3 Credit Hours.
Introduces basic concepts in electric power generation, distribution, system control, and economic operation.

ECE 4321. Power System Engineering. 3 Credit Hours.
To introduce basic concepts of electric power system design, encompassing protection, stability, and control.

ECE 4325. Electric Power Quality. 3 Credit Hours.
Transients and harmonics in power systems, analysis methods and mitigation practices. Causes of power quality problems and relationship to equipment susceptibility. Credit not allowed for both ECE 4325 and ECE 6340.

ECE 4330. Power Electronics. 3 Credit Hours.
Introduces power semiconductor devices and power electronic converters, including single-phase and three-phase ac/dc rectifiers, ac voltage controllers, dc/dc converters, and dc/ac inverters.

ECE 4335. Electric Machinery Analysis. 3 Credit Hours.
Advanced theory of AC machines, including AC motor winding design, finite element analysis, induction motor design, permanent magnet machine design, and synchronous machine dynamics. Credit is not allowed for both ECE 4335 and ECE 6335.

ECE 4350. Electromagnetic and Microwave Applications. 3 Credit Hours.
Presents concepts of electromagnetic fields applied to microwave circuit design and antenna radiation. Credit will not be awarded for ECE 4350 and ECE 3065.

ECE 4360. RF-Microwave Measurement Laboratory. 2 Credit Hours.
RF/microwave measurement theory and techniques. Use of state-of-the-art equipment operating into the GHz range.

ECE 4370. Antenna Engineering. 3 Credit Hours.
Basic theory, application, and design of a broad range of antennas.

ECE 4371. Antenna Engineering Laboratory. 1 Credit Hour.
Experimentation to develop a practical understanding of antennas and their properties.

ECE 4390. Introduction to Radar and Electromagnetic Sensing. 3 Credit Hours.
Introduces students to radar systems, including pulsed, CW, CWFM, and MTI radars. Other techniques for electromagnetic sensing such as radiometry and EM tagging are discussed.

ECE 4391. Electromagnetic Compatibility. 3 Credit Hours.
To study electromagnetic interference and susceptibility of electrical systems, with application to analog and digital circuits.

ECE 4415. RF Engineering I. 3 Credit Hours.
Fundamentals of RF engineering. Components at high frequencies, device modeling, amplifiers, lumped-element and microstrip impedance transformation networks, S-parameter-based design of RF and microwave amplifiers.

ECE 4418. RF Engineering II. 3 Credit Hours.
Fundamentals learned in RF-I are employed to design the elements of radio receivers, transmitters, and similar systems. Systems analysis, mixers, detectors, power amplifiers, low-noise amplifiers, and oscillators are covered.

ECE 4420. Digital Integrated Circuits. 3 Credit Hours.
Analysis and design of bipolar and MOS digital integrated circuit families and their applications in modern electronic systems.

ECE 4430. Analog Integrated Circuits. 3 Credit Hours.
Analysis and design of analog ICs using analytic techniques and CAD tools. Topics include amplifiers, current sources, output circuits, and other analog building blocks.

ECE 4435. Operational Amplifier Design. 3 Credit Hours.
Analysis and design techniques for utilization of integrated circuit operational amplifiers for applications in electronic systems.

ECE 4445. Audio Engineering. 3 Credit Hours.
Concepts of acoustics and electroacoustic modeling for the analysis and design of microphones, loudspeakers, and crossover networks. Methods of analysis and design of audio power amplifiers.

ECE 4446. Audio Engineering Laboratory. 1 Credit Hour.
A companion laboratory to ECE 4445. Design, analysis, construction, modeling, and testing of circuits and systems pertaining to audio engineering.

ECE 4448. Guitar Amplification and Effects. 3 Credit Hours.
Mathematical analysis and laboratory measurement of vibrating strings, electromagnetic pickups, vacuum tube amplifiers, solid-state distortion, and swept filter effects.

ECE 4450. Analog Circuits for Music Synthesis. 3 Credit Hours.
Circuits from classic analog synthesizers: nonlinear waveshapers and voltage-controlled oscillators, filters, and amplifier using operational transconductance amplifliers and the dynamic resistance of semiconductors.

ECE 4452. IC Fabrication. 3 Credit Hours.
Introduction to microelectronic processing technologies and CMOS. Includes a laboratory for fabrication/testing of MOS transistors, basic CMOS circuits, integrated resistors and capacitors. Credit will not be awarded for ECE 4452 and ECE 4752.

ECE 4460. Introduction to Electronic Systems Packaging. 3 Credit Hours.
Introduction to packaging technologies, technology drivers, electrical performance, thermal management, materials, optoelectronics, RF integration, reliability, system issues, assembly, testing.

ECE 4470. Devices for Renewable Energy. 3 Credit Hours.
Students study the engineering compromises, operational physics and environmental impact of a variety of devices from solar cells, batteries, thermoelectric devices and wind generators.

ECE 4500. Optical Engineering. 3 Credit Hours.
Introduction to applications of geometric, physical optics to engineering, including optical measurements, matrix methods, instruments, interference, holography, beam optics, Fourier optics, and diffraction.

ECE 4502. Optical Fiber Communications. 4 Credit Hours.
Combined lecture-laboratory exploration of the technology of fiber optics, with emphasis on optical fiber communication systems. Credit will not be awarded for ECE 4502 and ECE 4501.

ECE 4550. Control System Design. 4 Credit Hours.
Design of control algorithms using state-space methods, microcontroller implementation of control algorithms, and laboratory projects emphasizing motion control applications.

ECE 4560. Introduction to Automation and Robotics. 4 Credit Hours.
Concurrent engineering principles; robotic manipulator kinematics, dynamics, and control; applications of robots in industry, medicine, and other areas; team projects and hands-on laboratory experience.

ECE 4570. System Theory for Communication and Control. 4 Credit Hours.
Study of the basic concepts in linear system theory and numerical linear algebra with applications to communication, computation, control, and signal processing. A unified treatment.

ECE 4575. Numerical Methods for Optimization and Optimal Control. 3 Credit Hours.
Algorithms for numerical optimization and optimal control, Gradient-descent techniques, linear programming, numerical linear system solvers, second-order methods of optimizing performance of dynamical systems.

ECE 4580. Computational Computer Vision. 3 Credit Hours.
Computational and theoretical aspects of computer vision. Application areas include robotics, autonomous vehicles, tracking, and image-guided surgery. Includes major project.

ECE 4601. Communication Systems. 3 Credit Hours.
To present the fundamentals of modern digital communication systems and evaluate their performance with realistic channel models.

ECE 4605. Topics in Networks. 4 Credit Hours.
Reviews on networking fundamentals. Latest networking technologies in wireless and wireline networks. Machine learning and data science in networks or other emerging topics. Projects included.

ECE 4606. Wireless Communications. 3 Credit Hours.
Cellular concept, wireless propagation modeling; types of digital modulation used in wireless systems, diversity combining, performance over fading channels, and multiple access techniques.

ECE 4607. Mobile and Wireless Networks. 3 Credit Hours.
Basics of mobile and wireless networking. Architectures and communication protocols for wireless sensor networks, wireless local area networks, ad-hoc networks, cellular systems, WiMAX, and Wireless Mesh Networks.

ECE 4612. Telecommunications Systems Laboratory. 1 Credit Hour.
Basic digital telecommunications systems are examined in a laboratory setting using electronic modules, covering concepts such as modulation, channel coding, AWGN, eye diagrams, and BER. Credit will not be awarded for ECE 4612 and ECE 4602.

ECE 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

ECE 4699. Undergraduate Research. 1-12 Credit Hours.
Independent Research conducted under the guidance of a faculty member.

ECE 4723. Interdisciplinary Capstone Design. 3 Credit Hours.
Seniors will work in teams to apply a systematic design process to real multi-disciplinary problems. Problems selected from a broad spectrum of interest areas, including biomedical, environmental, mechanical, industrial design, electrical and thermal/fluids. Projects must be based on the knowledge and skills acquired in earlier course work, and incorporate appropriate engineering standards and multiple realistic constraints. Emphasis is placed on the design process, the technical aspects of the design, and on reducing the proposed design to practice. The course consists of faculty and guest lectures, prototyping in design studios, and a multi-disciplinary design project.

ECE 4751. Laser Theory and Applications. 3 Credit Hours.
Provides an introduction to the theory and applications of laser principles and related instrumentation. Emphasis is on the fundamental principles underlying laser action. Crosslisted with PHYS 4751.

ECE 4753. Topics in Engineering Practice. 3 Credit Hours.
Topics of current importance offered in collaboration with an approved partner of Georgia Tech's Distance Learning Program. Crosslisted with ME 4753.

ECE 4754. Electronics Packaging Assembly, Reliability, Thermal Management, and Test. 3 Credit Hours.
The course provides hands-on instruction in electronics packaging, including assembly, reliability, thermal management, and test of next-generation microsystems. Crosslisted with ME and MSE 4754.

ECE 4755. Electronic Packaging Substrate Fabrication. 3 Credit Hours.
This course provides hands-on instruction in basic packaging substrate fabrication techniques, including interconnect design and testing, dielectric deposition, via formation, and metallization. Crosslisted with CHE 4755.

ECE 4761. Industrial Controls and Manufacturing. 3 Credit Hours.
Students are introduced to industrial controls and the fundamentals of manufacturing with hands-on experience based on lab projects using industry software and hardware for communications and control. Crosslisted with PTFE 4761.

ECE 4781. Biomedical Instrumentation. 3 Credit Hours.
A study of medical instrumentation from a systems viewpoint. Pertinent physiological and electro-physiological concepts will be covered. Credit not allowed for both ECE 4781 and (CHE 4781 or CHBE 4781 or BMED 4781 or ME 4781).

ECE 4782. Biosystems Analysis. 3 Credit Hours.
Analytical methods for modeling biological systems, including white-noise protocols for characterizing nonlinear systems. Crosslisted with BMED, CHE and ME 4782.

ECE 4783. Introduction to Medical Image Processing. 3 Credit Hours.
A study of mathematical methods used in medical acquisition and processing. Concepts, algorithms, and methods associated with acquisition, processing, and display of two- and three-dimensional medical images are studied. Crosslisted with BMED 4783.

ECE 4784. Engineering Electrophysiology. 3 Credit Hours.
Basic concepts of electrophysiology from an engineering perspective. Functionality of relevant organs and systems; instrumentation tools which monitor electrophysiology function. Crosslisted with BMED 4784.

ECE 4786. Medical Imaging Systems. 3 Credit Hours.
Introduce major biomedical and clinical imaging modalities including X-ray radiography, computed tomography (CT), nuclear medicine (SPECT and PET), magnetic resonance imaging (MRI), and ultrasound.

ECE 4795. GPU Programming for Video Games. 3 Credit Hours.
3-D graphics pipelines. Physically-based rendering. Game engine architectures. GPU architectures. Graphics APIs. Vertex and pixel shader programming. Post-processing effects. Deferred rendering.

ECE 4801. Special Topics. 1 Credit Hour.

ECE 4802. Special Topics. 2 Credit Hours.

ECE 4803. Special Topics. 3 Credit Hours.

ECE 4804. Special Topics. 4 Credit Hours.

ECE 4805. Special Topics. 5 Credit Hours.

ECE 4811. Special Topics. 1 Credit Hour.

ECE 4812. Special Topics. 2 Credit Hours.

ECE 4813. Special Topics. 3 Credit Hours.

ECE 4814. Special Topics. 4 Credit Hours.

ECE 4815. Special Topics. 5 Credit Hours.

ECE 4816. Special Topics. 6 Credit Hours.

ECE 4823. Special Topics. 3 Credit Hours.

ECE 4824. Special Topics. 4 Credit Hours.
special topics.

ECE 4833. Special Topics. 3 Credit Hours.

ECE 4853. ECE Single-Semester Create-X Capstone Design. 3 Credit Hours.
A single-semester ECE culminating design experience in which interdisciplinary teams propose, prototype, test, demonstrate, formally present, and document projects incorporating engineering standards and realistic constraints.

ECE 4863. Special Topics. 3 Credit Hours.
Special Topics in ECE.

ECE 4871. Special Topics. 1 Credit Hour.

ECE 4872. Special Topics. 2 Credit Hours.
Special Topics in ECE.

ECE 4873. Special Topics. 3 Credit Hours.

ECE 4881. Special Topics. 1 Credit Hour.

ECE 4882. Special Topics. 2 Credit Hours.

ECE 4883. Special Topics. 3 Credit Hours.

ECE 4884. Special Topics. 4 Credit Hours.

ECE 4891. Special Topics. 1 Credit Hour.

ECE 4892. Special Topics. 2 Credit Hours.

ECE 4893. Special Topics. 3 Credit Hours.

ECE 4894. Special Topics. 4 Credit Hours.

ECE 4900. Special Problems. 1-21 Credit Hours.

ECE 4901. Special Problems. 1-21 Credit Hours.

ECE 4902. Special Problems. 1-21 Credit Hours.

ECE 4903. Special Problems. 1-21 Credit Hours.

ECE 4951. Undergraduate Research I. 1-21 Credit Hours.
Participation in an individual or group research project under the direction of a faculty member.

ECE 4952. Undergraduate Research II. 1-21 Credit Hours.
Participation in an individual or group research project under the direction of a faculty member.

ECE 4XXX. Electrical and Computer Engineering Elective. 1-21 Credit Hours.

ECE 6001. Technology Entrepreneurship: Teaming, Ideation, Entrepreneurship, Intrepreneurship, and Leadership. 3 Credit Hours.
Principles of entrepreneurship and intrapreneurship: teaming, ideation, and leadership. Customer discovery, cognitive biases, rapid prototyping, business models, negotiation, and capital raises will be also covered.

ECE 6100. Advanced Computer Architecture. 3 Credit Hours.
Comprehensive coverage of the architecture and system issues that confront the design of high-performance workstation/PC computer architectures with emphasis on quantitative evaluation. Credit is not allowed for both ECE 6100 and any of the following courses: ECE 4100, CS 4290, CS 6290.

ECE 6102. Dependable Distributed Systems. 3 Credit Hours.
Concepts, theory, and practice of dependable distributed systems. Techniques for tolerating hardware and software faults. Security aspects such as confidentiality, availability, and integrity.

ECE 6110. CAD for Computer Communication Networks. 3 Credit Hours.
Models and algorithms for simulation-based design and evaluation of computer networks and network protocols.

ECE 6115. Interconnection Networks for High-Performance Systems. 3 Credit Hours.
Architecture, design methodology, and trade offs of interconnection networks at various scales – on-chip (for multicore CPUs and accelerators) and off-chip (for HPC and datacenters)

ECE 6122. Advanced Programming Techniques. 3 Credit Hours.
Covers a number of advanced topics in programming methods, data management, distributed computing, and advanced algorithms used in typical engineering applications. Credit will not be awarded for ECE 6122 and ECE 4122.

ECE 6130. Advanced VLSI Systems. 3 Credit Hours.
An advanced treatment of VLSI systems analysis, design, and testing with emphasis on complex systems and how they are incorporated into a silicon environment. Credit is not allowed for both ECE 4130 and ECE 6130.

ECE 6132. Computer-aided VLSI System Design. 3 Credit Hours.
Theory and practice of computer-aided VLSI digital systems design. Logic synthesis, semi-custom VLSI design, high-level synthesis, low-power systems, and hardware/software co-design. Individual and group projects.

ECE 6133. Physical Design Automation of VLSI Systems. 3 Credit Hours.
Various design automation problems in the physical design process of VLSI circuits including clustering, partitioning, floor planning, placement, routing, and compaction.

ECE 6135. Digital Systems in Nanometer Nodes. 3 Credit Hours.
An advanced treatment of design challenges, such as power, variability, and reliability associated with digital integrated circuits and systems in nanometer nodes.

ECE 6140. Digital Systems Test. 3 Credit Hours.
Course covers the science of digital systems testing, fault models, algorithms for fault simulation and test generation, design for testability and built-in self-test.

ECE 6156. Hardware-Oriented Security and Trust. 3 Credit Hours.
Fundamental concepts, foundation, and methodologies for the design of trustworthy circuits including protection of the hardware platform against tampering. Physical cloning of cryptographic VLSI circuits.

ECE 6200. Biomedical Applications of Microelectromechanical Systems. 3 Credit Hours.
MEMS processing technologies, design of fabrication process flows, and applications of the technologies to the development of biomedical micro instrumentation and dectection methodologies.

ECE 6229. Introduction to Microelectromechanical Systems. 3 Credit Hours.
Introduction to Micro-Electro-Mechanical systems: Microfabrication techniques including: photolithography, etching, physical and chemical vapor deposition, electroplating, bonding and polymer processing. Application to sensors and actuators. Credit not allowed for both ECE 6229 and ME 6229 or CHBE 6229.

ECE 6250. Advanced Digital Signal Processing. 3 Credit Hours.
An introduction to advanced signal processing methods that are used in a variety of applications areas.

ECE 6254. Statistical Machine Learning. 3 Credit Hours.
An introduction to the theory of statistical learning and practical machine learning algorithms with applications in signal processing and data analysis.

ECE 6255. Digital Processing of Speech Signals. 3 Credit Hours.
The application of digital signal processing to problems in speech communication. Part of this goal requires a laboratory project.

ECE 6258. Digital Image Processing. 3 Credit Hours.
An introduction to the theory of multidimensional signal processing and digital image processing, including key applications in multimedia products and services, and telecommunications.

ECE 6260. Data Compression and Modeling. 3 Credit Hours.
Theory and algorithms of signal encoding and decoding for data compression. Applications in information systems, digital telephony, digital television, and multimedia Internet.

ECE 6270. Convex Optimization: Theory, Algorithms, and Applications. 3 Credit Hours.
This course provides an introduction to convex optimization, covering the mathematical fundamentals of convex analysis and duality theory, algorithms, and modelling of practical applications.

ECE 6271. Adaptive Filtering. 3 Credit Hours.
Basic theory of adaptive filter design and implementation. Steepest decent, LMS algorithms, nonlinear adaptive filters, and neural networks. Analysis of performance and applications.

ECE 6272. Fundamentals of Radar Signal Processing. 3 Credit Hours.
Signal modeling including radar cross section, multipath, and clutter. Properties of the ambiguity function and coded waveforms. Algorithms for Doppler processing, detection, and radar imaging.

ECE 6273. Methods of Pattern Recognition with Application to Voice. 3 Credit Hours.
Theory and application of pattern recognition with a special application section for automatic speech recognition and related signal processing.

ECE 6274. Statistical Natural Language Processing. 3 Credit Hours.
Foundations of statistical natural language processing established for text data analysis, language engineering, information extraction, and statistical inference. Applications using large text datasets are illustrated.

ECE 6276. DSP Hardware Systems Design. 3 Credit Hours.
A study of theory and practice in the design and implementation of DSP algorithms on programmable processors, multiprocessors, and ASICs.

ECE 6279. Spatial Array Processing. 3 Credit Hours.
Introduce application areas where signals are sampled over space and time. Transfer knowledge of time-based techniques to spatial processing. Develop algorithms unique to spatial processing.

ECE 6280. Cryptography & Security. 3 Credit Hours.
Algebraic and number theory apporaches to cryptographic techniques, information security, secret key and public key encryption, signature schemes, hash functions, message authentication, and key distribution. Credit not allowed for both ECE 6280 and CS 6260.

ECE 6282. Radar Imaging. 3 Credit Hours.
An indepth study of digital signal processing methods for Synthetic Aperture Radar (SAR) image formation. Methods are also applicable to sonar.

ECE 6283. Harmonic Analysis for Signal Processing. 3 Credit Hours.
Explores the role of sparse representations in signal processing. Specific topics include: frame decompositions, approximation theory, inverse problems, imaging, and compressed sensing.

ECE 6320. Power Systems Control and Operation. 3 Credit Hours.
Introduction to methods used in the real-time operation and control of power systems as well as to the hardware and software technology of energy management systems (EMS). Credit will not be awarded for both ECE 6320 and ECEP 6301.

ECE 6321. Power System Stability. 3 Credit Hours.
Techniques for stability analysis of electric power systems and applications of these methods.

ECE 6322. Power System Planning and Reliability. 3 Credit Hours.
To introduce basic concepts as well as analysis and optimization techniques underlying reliability assessment of electric power systems and planning techniques. Credit will not be awarded for both ECE 6322 and ECEP 6305.

ECE 6323. Power System Protection. 3 Credit Hours.
Theory and practice of modern power system protection techniques. Credit will not be awarded for both ECE 6323 and ECEP 6351.

ECE 6331. Power Electronic Circuits. 3 Credit Hours.
The analysis, control, and design of switching power converters: rectifiers, cycloconverters, voltage-sourced and current-source inverters, dc-dc converters, pfc and resonant converts.

ECE 6335. Electric Machinery Analysis. 3 Credit Hours.
An introduction to the analysis and basic construction principles of rotating electric machines and transformers, including ac synchronous and induction machines and dc machines. Credit is now allowed for both ECE 4335 and ECE 6335.

ECE 6336. Dynamics and Control of Electric Machine Drives. 3 Credit Hours.
A study of the dynamics and control of electric machinery and variable speed machine drive systems.

ECE 6337. Electricity Markets. 3 Credit Hours.
Comprehensive introduction to markets for electrical energy, including economic theory, market design, utility models, effects of the physical grid, and grid services.

ECE 6350. Applied Electromagnetics. 3 Credit Hours.
The methodology and application of advanced electromagnetic theory.

ECE 6360. Microwave Design. 3 Credit Hours.
Applications of electromagnetic theory to microwave components and systems. Introduction to the latest characterization and design techniques including monolithic microwave integrated circuit (MMIC) technology.

ECE 6361. Microwave Design Laboratory. 3 Credit Hours.
This laboratory course will teach microwave measurement/design fundamentals for both passive and active components. Students will use both CAD tools and network analyzers.

ECE 6370. Electromagnetic Radiation and Antennas. 3 Credit Hours.
The fundamentals of electromagnetic radiation and antennas.

ECE 6374. Cyber-Physical Security in Electric Energy Systems. 3 Credit Hours.
This course provides an introduction to cyber-physical infrastructure for protection and control of electric energy systems, communication protocols, standardization and practices for cyber security.

ECE 6375. Radio Wave Propagation in the Earth and Space Environment. 3 Credit Hours.
How the Earth's atmosphere, space plasma environment, and solar space weather, vary to affect communication, navigation, space science, and remote sensing, across the electromagnetic spectrum.

ECE 6380. Introduction to Computational Electromagnetics. 3 Credit Hours.
The practical application of the finite-difference time-domain and finite element techniques to electromagnetic problems. Computer projects are required.

ECE 6390. Satellite Communications and Navigation Systems. 3 Credit Hours.
To introduce satellite communications and navigation system design including microwave transmission, satellite transponders, earth station hardware, and satellite networks. A design project is required.

ECE 6412. Analog Integrated Circuit Design. 3 Credit Hours.
Design of analog circuits using CMOS and bipolar technologies.

ECE 6414. Analog Integrated System Design. 3 Credit Hours.
Design of analog systems using CMOS and bipolar technologies. A higher level of design for analog and digital systems is presented.

ECE 6420. Wireless IC Design. 3 Credit Hours.
Wireless system specifications are translated to architectures and building blocks compatible with silicon technology. The course focuses on the analysis and design of these blocks.

ECE 6422. Interface IC Design for MEMS and Sensors. 3 Credit Hours.
Design of low-noise interface circuits for sensors and micromechanical devices (MEMS). Design of integrated microsystems.

ECE 6435. Neuromorphic Analog VLSI Circuits. 3 Credit Hours.
Large-scale analog computation for sensory and motor processing. Analog building blocks are presented, leading to VLSI systems inspired by neurobiological architectures and computational paradigms.

ECE 6444. Silicon-Based Heterostructure Devices and Circuits. 3 Credit Hours.
Theory and design of novel silicon-germanium microelectronic devices and circuits. Materials, device physics, fabrication, measurement, circuit design, and system applications.

ECE 6445. Power Integrated-Circuit Design. 3 Credit Hours.
Analysis and design of linear dc-dc regulators and switched-inductor dc-dc supplies with CMOS and BiCMOS integrated circuits (ICs).

ECE 6450. Introduction to Microelectronics Technology. 3 Credit Hours.
Presents the fundamentals of microelectronics material, device, and circuit fabrication.

ECE 6451. Introduction to the Theory of Microelectronics. 3 Credit Hours.
Basis of quantum mechanics, statistical mechanics, and the behavior of solids to serve as an introduction to the modern study of semiconductors and semiconductor devices.

ECE 6453. Theory of Electronic Devices. 3 Credit Hours.
Presents the fundamentals of electronic device operation.

ECE 6455. Semiconductor Process Control. 3 Credit Hours.
This course is designed to explore methods of applying statistical process control and statistical quality control to semiconductor manufacturing processes. Students will be required to complete a design project.

ECE 6456. Solar Cells. 3 Credit Hours.
To provide a practical understanding of semiconductor materials and technology as it relates to design and development of efficient solar cells and photovoltaic systems.

ECE 6458. Gigascale Integration. 3 Credit Hours.
Hierarchy of physical principles that enable understanding and estimation of future opportunities to achieve multibillion transistor silicon chips using sub-0.25 micron technology.

ECE 6460. Microelectromechanical Devices. 3 Credit Hours.
Fundamental concepts for desgin of microelectromechanical devices (MEMS), including mechanical and thermal behavior of materials and structures, transduction principles, transducer design, and modeling.

ECE 6465. Memory Device Technologies and Applications. 3 Credit Hours.
This course covers semiconductor memory technologies SRAM, DRAM, FLASH and emerging non-volatile NVMs, including bit-cell design, peripheral circuitry, array architecture, scaling trend and in-memory computing.

ECE 6500. Fourier Techniques and Signal Analysis. 3 Credit Hours.
Introduction to the use of Fourier Methods for analysis of signals.

ECE 6501. Fourier Optics and Holography. 3 Credit Hours.
Applications of the Fourier transform and linear systems theory to the analysis of optical propagation, diffraction imaging, holography, wavefront modulation, and signal processing.

ECE 6510. Electro-Optics. 3 Credit Hours.
Study of the fundamental principles and primary applications of lasers, and of detectors of optical radiation.

ECE 6515. Nanophotonics. 3 Credit Hours.
Design of nano-structures to guide light and to develop a new set of optical devices.

ECE 6520. Integrated Optics. 3 Credit Hours.
Theory and design of integrated photonic devices.

ECE 6522. Nonlinear Optics. 3 Credit Hours.
Provides an introduction to the field of nonlinear optics, exploring the physical mechanisms, applications, and experimental techniques.

ECE 6530. Modulation, Diffractive, and Crystal Optics. 3 Credit Hours.
Provides a working knowledge of temporal and spatial optical modulation, diffractive optical devices, and crystal optics.

ECE 6540. Organic Optoelectronics. 3 Credit Hours.
Fundamental understanding of the optical and electronic properties of organic materials and devices that form the basic of the emerging technological area of printed flexible optoelectronics.

ECE 6542. Optoelectronics: Devices, Integration, Packaging, Systems. 3 Credit Hours.
Optoelectronic devices (detectors, emitters, modulators) from the practical realized and theoretical performance perspective. Explores monolithic and hybrid integration of devices, packaging, and system implementation.

ECE 6543. Fiber-optic Networks. 3 Credit Hours.
Architectural, performance and design aspects of fiber-optic communications networks, components, and technologies. Relationship between the physical network implementation and the higher-level network architecture.

ECE 6550. Linear Systems and Controls. 3 Credit Hours.
Introduction to linear system theory and feedback control. Topics include state space representations, controllability and observability, linear feedback control. Credit will not be awarded for both ECE 6550 and AE 6530.

ECE 6551. Digital Control. 3 Credit Hours.
Techniques for analysis and synthesis of digital control systems. Sample-data systems, state-space systems and linear feedback design.

ECE 6552. Nonlinear Systems and Control. 3 Credit Hours.
Classical analysis techniques and stability theory for nonlinear systems. Control design for nonlinear systems, including robotic systems. Design projects.

ECE 6553. Optimal Control and Optimization. 3 Credit Hours.
Optimal control of dynamic systems, numerical optimization, techniques and their applications in solving optical-trajectory problems.

ECE 6554. Adaptive Control. 3 Credit Hours.
Methods of parameter estimation and adaptive control for systems with constant or slowly varying unknown parameters. MATLAB design projects emphasizing applications to physical systems.

ECE 6555. Optimal Estimation. 3 Credit Hours.
Techniques for signal and state estimation in the presence of measurement and process noise with the emphasis on Wiener and Kalman filtering.

ECE 6558. Stochastic Systems. 3 Credit Hours.
Advanced techniques in stochastic analysis with emphasis on stochastic dynamics, nonlinear filtering and detection, stochastic control, and stochastic optimization and simulation methods.

ECE 6559. Advanced Linear Systems. 3 Credit Hours.
Study of multivariable linear system theory and robust control design methodologies.

ECE 6560. Partial Differential Equations in Image Processing and Computer Vision. 3 Credit Hours.
Mathematical foundations and numerical aspects of partial-differential equation techniques used in computer vision. Topics inculde image smoothing and enhancement, edge detection, morphology, and image reconstruction.

ECE 6562. Autonomous Control of Robotic Systems. 3 Credit Hours.
Fundamental issues associated with autonomous robot control. Emphasizes biological perspective that forms the basis of many current developments in robotics.

ECE 6563. Networked Control and Multiagent Systems. 3 Credit Hours.
Covers tools and techniques for networked control systems as well as application domains and promising research directions.

ECE 6564. Nonlinear Dynamics and Chaos. 3 Credit Hours.
Introduction to the nonlinear dynamics of continuous-time and discrete-time systems. Routes to chaos. Quantification of chaos. Nonlinear time series analysis. Applications of Chaos Theory.

ECE 6601. Random Processes. 3 Credit Hours.
To develop the theoretical framework for the processing of random signals and data.

ECE 6602. Digital Communications. 3 Credit Hours.
Basic M-ary digital communications systems, with emphasis on system design and performance analysis in the presence of additive noise.

ECE 6603. Advanced Digital Communications. 3 Credit Hours.
The theory and practice of efficient digital communications over dispersive channels, including adaptive equalization and synchronization.

ECE 6604. Personal and Mobile Communications. 3 Credit Hours.
To introduce various topics that are fundamental to cellular mobile telephone systems.

ECE 6605. Information Theory. 3 Credit Hours.
To introduce the mathematical theory of communications. Emphasis will be placed on Shannon's theorems and their use in the analysis and design of communication systems.

ECE 6606. Coding Theory and Applications. 3 Credit Hours.
To introduce the theory and practice of error control coding, with emphasis on linear, cyclic, convolutional, and parallel concatenated codes.

ECE 6607. Computer Communication Networks. 3 Credit Hours.
Fundamental concepts of computer network architecture and protocols.

ECE 6610. Wireless Networks. 3 Credit Hours.
Fundamental concepts of wireless networks.

ECE 6612. Computer Network Security. 3 Credit Hours.
Fundamental concepts of network information security, including encryption, secure access methods, and vulnerabilities in network protocols, operating systems, and network applications.

ECE 6613. Broadband Access Networks. 3 Credit Hours.
To develop architectures and technologies of wireless and wired broadband access networks including 5G wireless, fiber to the home, hybrid fiber-coax, and digital subscriber line.

ECE 6615. Sensor Networks. 3 Credit Hours.
Basics of sensor network communications. Applications, architectures, and communication protocols for sensor networks are treated in depth.

ECE 6710. Ethics of Biotechnology and Bioengineering Research. 3 Credit Hours.
This course examines the ethics of biotechnological research, including issues in the realm of research ethics, bioethics, and healthcare robotics.

ECE 6727. Cyber Security Practicum. 5 Credit Hours.
Capstone independent study project placing each student in a commercial, academic or government setting where he or she identifies a major cyber security problem, and explores and evaluates a solution that addresses it with realistic assumptions about the organizational context. The chosen problem must be approved by course instructor. Cross-listed with PUBP and CS 6727.

ECE 6730. Modeling and Simulation: Foundations and Implementation. 3 Credit Hours.
Foundations and algorithms concerning the development of conceptual models for systems, and their realization in the form of computer software; discrete and continuous models. Crosslisted with CSE 6730.

ECE 6744. Topics in Engineering Practice. 3 Credit Hours.
Topics of current importance offered in collaboration with an approved partner of Georgia Tech's Distance Learning Program. Crosslisted with ME 6744.

ECE 6747. Advanced Topics in Malware Analysis. 3 Credit Hours.
This course covers advanced approaches for the analysis of malicious software and explores recent research and unsolved problems in software protection and forensics.

ECE 6770. Introduction to Cyber-Physical Systems Security. 3 Credit Hours.
This course provides an introduction to security issues relating to various cyber-physical systems including industrial control systems and those considered critical infrastructure systems.

ECE 6771. Optoelectronics: Materials, Processes, Devices. 3 Credit Hours.
Optoelectronic materials, physical processes, and devices. Includes compound semiconductor materials, excitation, recombination, gain, and modulation processes and devices such as emitters, detectors, and modulators. Crosslisted with PHYS 6771.

ECE 6776. Integrated Low-Cost Microelectronics Systems Packaging. 3 Credit Hours.
Introduction to cross-disciplinary microelectronic packaging technologies, including electrical design, thermal considerations and technologies, reliability, optoelectronic packaging, and RF-/mm-packaging. Crosslisted with ME and MSE 6776.

ECE 6779. Thermal Engineering for Packaging of Micro and Nano Systems. 3 Credit Hours.
Passive, active, and hybrid thermal management techniques, and computational modeling of micro systems. Air cooling, simlge phase and phase change liquid cooling, heat pipes, and thermoelectrics. Crosslisted with ME 6779.

ECE 6780. Medical Image Processing. 3 Credit Hours.
Studying biomedical image analysis techniques including image enhancement, analysis, classification, and interpretation for medical decision making through practicals and projects. Cross-listed with BMED 6780.

ECE 6781. Biomedical Sensing Systems. 3 Credit Hours.
A study of physiological sensing topics from a systems viewpoint. Pertinent physiological and electro-physiological concepts will be covered. No prior knowledge of physiology or biology is needed.

ECE 6786. Medical Imaging Systems. 3 Credit Hours.
A study of the principles and design of medical imaging systems such as X-ray, ultrasound, nuclear medicine, and nuclear magnetic resonance. Crosslisted with BMED 6786.

ECE 6790. Information Processing Models in Neural Systems. 3 Credit Hours.
Examines "top-down" modeling approaches for sensorineural systems, where optimal computational principles used in engineering(e.g., information theory, Bayesian inference, control theory) explain observed information processing.

ECE 6792. Manufacturing Seminar. 1 Credit Hour.
Guest speakers on a broad range of manufacturing-related topics: research, applications, and technology. Required for Certificate in Manufacturing. Crosslisted with ISYE and ME 6792.

ECE 6XXX. Electrical and Computer Engineering Elective. 1-21 Credit Hours.

ECE 7000. Master's Thesis. 1-21 Credit Hours.

ECE 7055. GT-SJTU. 12 Credit Hours.
For GT-SJTU dual-MS students during terms when they are not taking other GT courses. Placeholder course.

ECE 7056. GT-TU. 12 Credit Hours.
For GT-TU double-MS students during terms when they are not taking other GT courses.

ECE 7057. GT-Shenzhen Research. 12 Credit Hours.
For GT-Shenzhen students during terms when they are in Atlanta on research internship with GT-Atlanta faculty.

ECE 7103. Advanced Memory System. 3 Credit Hours.
Covers the basic trade-offs in architecting a high performance memory hierarchy at all levels, starting from the on-chip cache to main memory and storage sub-system.

ECE 7141. Advanced Digital Systems Test. 3 Credit Hours.
Design and test techniques for high-speed digital systems operating at rates above 100 MHz with a practical emphasis via substantial projects.

ECE 7142. Fault Tolerant Computing. 3 Credit Hours.
Key concepts in fault-tolerant computing. Understanding and use of modern fault-tolerant hardware and software design practices. Case studies.

ECE 7252. Advanced Signal Processing Theory. 3 Credit Hours.
A lecture and seminar treatment of the latest developments in signal processing. Emphasis is placed on current literature and emerging research areas.

ECE 7350. Topics in Analytical Electromagnetics. 3 Credit Hours.
An in-depth treatment of several analytical techniques used in current practice for solving real-world EM wave propagation problems and their impact on wireless communications.

ECE 7380. Topics in Computational Electromagnetics. 3 Credit Hours.
Computational approaches for applications such as radar signature prediction, microwave antenna and device design, and modeling techniques for electronic packaging.

ECE 7721. Are You Thinking of Becoming An Academic?. 1 Credit Hour.
How to run a successful research program, advise students, apply and get a job in academia, navigate promotion and tenure, and other aspects of academia.

ECE 7722. Future Faculty Practicum. 3 Credit Hours.
The objective of the proposed class is to prepare students interested in applying for faculty positions for interview season and for successful start of academic career. After this class, students will have prepared material for applying for academic positions as well as developed interview talk with detailed feedback.

ECE 7741. Robotics Professional Preparation. 1 Credit Hour.
Preparation for a professional career in Robotics. Local & visiting speakers. Program introduction. Technical resume preparation. GT Robotics labs & resources.

ECE 7742. Robotics Professional Preparation 2. 1 Credit Hour.
Preparation for a professional career in Robotics. Local & visiting speakers. Selecting and applying for Internship. Developing capstone project proposal. Public speaking practice and preparation.

ECE 7743. Robotics Professional Preparation 3. 1 Credit Hour.
Preparation for a professional career in Robotics. Local & visiting speakers. Interview preparation & career search. Technical report writing and presentation.

ECE 7750. Mathematical Foundations of Machine Learning. 3 Credit Hours.
Provides the mathematical background for two of the pillars of modern data science: linear algebra and applied probability.

ECE 7751. Probabilistic Graphical Models in Machine Learning. 3 Credit Hours.
The course provides an introduction to theory and practice of graphical models in machine learning. It covers three main aspects; representation, probabilistic inference, and learning.

ECE 7785. Introduction to Robotics Research. 3 Credit Hours.
Familiarizes students with the core areas of robotics; mechanics, control, perception, AI, and autonomy. Provides an introduction to the mathematical tools required in robotics research.

ECE 7999. Preparation for Doctoral Qualifying Examination. 1-21 Credit Hours.
This course is reseved for students who are studying for the ECE Preliminary Exam.

ECE 8001. ECE Seminar. 1 Credit Hour.
Speakers with diverse backgrounds and representing many different industries, professions, and institutions describe their experiences, entrepreneurial ventures, and research challenges.

ECE 8002. ECE Seminar. 1 Credit Hour.
Speakers with diverse backgrounds and representing different industries, professions, and institutions describe their experiences, entrepreneurial ventures, and research challenges.

ECE 8010. Research Seminar. 1 Credit Hour.
Seminar presentations describing ECE-related research projects, centers, and other activities at Georgia Tech.

ECE 8022. Professional Communication Seminar. 1 Credit Hour.
Seminar presentations on oral and written technical communication skills needed by electrical and computer engineering professionals. Credit for this course may not be used toward the master's degree in ECE.

ECE 8740. Robotics Internship. 1-21 Credit Hours.
Graduate Internship at a partner company, GTRI or a GT Robotics lab.

ECE 8741. Robotics Capstone Project. 3 Credit Hours.
Teams or individuals apply the knowledge and skills acquired throughout the MS program to a faculty supervised robotics project.

ECE 8750. Robotics Research Foundation I. 3 Credit Hours.
Multidisciplinary research course supervised by two robotics faculty from different schools participating in the robotics Ph.D. program.

ECE 8751. Robotics Research Foundation II. 3 Credit Hours.
Continuation of AE 8751 (Robotics Research Foundation I).

ECE 8801. Special Topics. 1 Credit Hour.

ECE 8802. Special Topics. 2 Credit Hours.

ECE 8803. Special Topics. 3 Credit Hours.
Special Topics in ECE.

ECE 8804. Special Topics. 4 Credit Hours.

ECE 8805. Special Topics. 5 Credit Hours.

ECE 8811. Special Topics. 1 Credit Hour.

ECE 8812. Special Topics. 2 Credit Hours.

ECE 8813. Special Topics. 3 Credit Hours.

ECE 8814. Special Topics. 4 Credit Hours.

ECE 8815. Special Topics. 5 Credit Hours.

ECE 8816. Special Topics. 6 Credit Hours.

ECE 8822. Special Topics. 2 Credit Hours.

ECE 8823. Special Topics. 3 Credit Hours.

ECE 8824. Special Topics. 4 Credit Hours.
special topics.

ECE 8833. Special Topics. 3 Credit Hours.

ECE 8843. Special Topics. 3 Credit Hours.

ECE 8853. Special Topics. 3 Credit Hours.

ECE 8863. Special Topics. 3 Credit Hours.

ECE 8873. Special Topics. 3 Credit Hours.

ECE 8881. Special Topics-Laboratory. 1 Credit Hour.

ECE 8882. Special Topics-Laboratory. 2 Credit Hours.

ECE 8883. Special Topics-Laboratory. 3 Credit Hours.

ECE 8884. Special Topics-Laboratory. 4 Credit Hours.

ECE 8891. Special Topics-Laboratory. 1 Credit Hour.

ECE 8892. Special Topics-Laboratory. 2 Credit Hours.

ECE 8893. Special Topics-Laboratory. 3 Credit Hours.

ECE 8894. Special Topics-Laboratory. 4 Credit Hours.

ECE 8900. Special Problems. 1-21 Credit Hours.

ECE 8901. Special Problems. 1-21 Credit Hours.

ECE 8902. Special Problems. 1-21 Credit Hours.

ECE 8903. Special Problems. 1-21 Credit Hours.

ECE 8997. Teaching Assistantship. 1-9 Credit Hours.
For students holding graduate teaching assistantships.

ECE 8998. Research Assistantship. 1-9 Credit Hours.
For students holding graduate research assistantships.

ECE 8999. Preparation for Doctoral Dissertation. 1-21 Credit Hours.
This course is reserved for students who are actively seeking Ph.D. advisors and /or dissertation topics.

ECE 9000. Doctoral Thesis. 1-21 Credit Hours.

Elect & Comp Engr-Professional (ECEP)

ECEP 6301. Power System Control and Operation. 3 Credit Hours.
Introduction to methods for the real time operation and control of power systems; to study the hardware and software technologies of modern energy management systems. Credit will not be awarded for both ECEP 6301 and ECE 6320.

ECEP 6304. Power Systems Economics. 3 Credit Hours.
Comprehensive introduction to electricity economics, including economic theory, markets, and policy. Renewable energy, information systems, smart grid, and consumers examined as drivers for market architecture.

ECEP 6305. Power System Planning & Reliability. 3 Credit Hours.
To introduce basic concepts as well as analysis and optimization techniques underlying reliability assessment of electric power systems and planning techniques. Credit not awarded for both ECEP 6305 and ECE 6322.

ECEP 6310. Capstone Project. 3 Credit Hours.
Apply methods and techniques learned throughout the program to conduct energy system design. Students prepare a project proposal leading to a final report and presentation.

ECEP 6351. Power System Protection. 3 Credit Hours.
The theory and practice of modern power system protection techniques. Credit will not be awarded for both ECEP 6351 and ECE 6323.

ECEP 8803. Special Topics. 3 Credit Hours.
Special topics for ECEP.

ECEP 8813. Special Topics. 3 Credit Hours.
Special topics in ECEP.

ECEP 8823. Special Topics. 3 Credit Hours.
Special Topics for ECEP.

Economics (ECON)

ECON 1001. Ecomics at Work. 1 Credit Hour.
Students are introduced to career opportunities in ecnomics and explore/identify how economics is used in different employment contexts.

ECON 1XXX. Economics Elective. 1-21 Credit Hours.

ECON 2100. Economic Analysis and Policy Problems. 3 Credit Hours.
Practice in analysis of decision problems of relevance to students in public policy and personal decision areas. Issues relating to individual decisions to produce, consume, invest, and trade will be explored. Analytical approaches will enable students to use and incorporate basic elements of micro- and macro-economic analysis and to appreciate issues regarding testing and measurements. Students can receive credit for either ECON 2100 or ECON 2101, or for ECON 2105/2106.Students cannot receive credit for ECON 2100 and ECON 2101 or for ECON 2100 and ECON 2105/2106 or for ECON 2101 and ECON 2105/2106.

ECON 2101. The Global Economy. 3 Credit Hours.
Historical and theoretical understanding of global economy, including international trade, finance, investment production; regional economic integration; economic development; environment, using micro and macro economic principles. Students can receive credit for either ECON 2100 or ECON 2101,or for ECON 2105/2106. Students cannot receive credit for ECON 2100 and ECON 2101 or for ECON 2100 and ECON 2105/2106 or for ECON 2101 and ECON 2105/2106.

ECON 2105. Principles of Macroeconomics. 3 Credit Hours.
This principles of economics course is intended to introduce students to concepts that will enable them to understand and analyze economic aggregates and evaluate economic policies. Students can receive credit for either ECON 2100 or ECON 2101,or for ECON 2105/2106. Students cannot receive credit for ECON 2100 and ECON 2101 or for ECON 2100 and ECON 2105/2106 or for ECON 2101 and ECON 2105/2106.

ECON 2106. Principles of Microeconomics. 3 Credit Hours.
This principles of economics course is intended to introduce students to concepts that will enable them to understand and analyze structure and performance of the market economy. Students can receive credit for either ECON 2100 or ECON 2101,or for ECON 2105/2106. Students cannot receive credit for ECON 2100 and ECON 2101 or for ECON 2100 and ECON 2105/2106 or for ECON 2101 and ECON 2105/2106.

ECON 2250. Statistics for Economists. 3 Credit Hours.
This course provides an introduction to probability theory and statistical inference. Students will explore tools and concepts relevant to the study of economics and gain a familiarity with statistical software widely used by economists.

ECON 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

ECON 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

ECON 2803. Special Topics. 3 Credit Hours.
Special topic offerings of current interest not included in permanent courses.

ECON 2XXX. Economics Elective. 1-21 Credit Hours.

ECON 3110. Advanced Microeconomic Analysis. 3 Credit Hours.
Review of important mathematical tools and techniques used in advanced microeconomics. Advanced topics include the estimation of demand and cost functions; the role of government in the economy (externalities, property rights, and public goods); public choice theory; factor markets (especially labor and capital markets); models of monopoly; pricing techniques used by firms with market power (monopolies and oligopolies); and game theory.

ECON 3120. Advanced Macroeconomic Analysis. 3 Credit Hours.
Develops theories and models of income and output determination in the open economy. Students explore the impacts of fiscal and monetary policies changes on aggregate economic outcomes.

ECON 3150. Economic and Financial Modeling. 3 Credit Hours.
Develops student ability to model the essential elements of the investment decision through the use of a valuation model and spreadsheet analysis. Expands upon basic knowledge of present value analysis to recognize risk, growth, capital markets, and market valuation of ongoing operations.

ECON 3160. Introduction to Empirical Economics: Data Visualization, Analysis, and Presentation. 3 Credit Hours.
Develops student abilities to logically formulate economic issues; identify and collect data; analyze the data using spreadsheet and presentation software; generate sound and defensible conclusions and recommendations; and make effective presentations of analysis and conclusions.

ECON 3161. Econometric Analysis. 3 Credit Hours.
Introduces multiple regression techniques with a focus on economic applications. Discusses extensions to discrete response, panel data, and time series models, as well as issues such as omitted variables, missing data, sample selection, randomized and quasi-experiments, and instrumental variables. Students learn to use software for data analytics.

ECON 3300. Economics of International Energy Markets. 3 Credit Hours.
Examines the economics of energy markets, encompassing the full value chain from production to consumption. Covers all major primary energy resources, including fossil fuels, nuclear, hydroelectric, and renewables, as well as electricity and transportation fuel markets. The course highlights health and environmental impacts, regulation and industrial organization, and energy policy at both the state and federal levels.

ECON 3XXX. Economics Elective. 1-21 Credit Hours.

ECON 4001. Coding and Data Analysis for Economics I. 1 Credit Hour.
This is the first in the series of three courses on data and empirical techniques used in economic analysis. Data cleaning, data management, and descriptive statistics methods are presented and applied to a variety of economics problems. The course prepares students for extensive use of statistical software to build data management skills and generate reports used in descriptive and explorative data analyses.

ECON 4002. Coding and Data Analysis for Economics II. 1 Credit Hour.
This is the second in the series of three courses on data and empirical techniques used in economic analysis. The course focuses on advanced skills that include large data management and manipulation, relational data management, extensive vertical and horizonal summative and remerging techniques to prepare data sets for advanced statistical and econometric analyses.

ECON 4003. Coding and Data Analysis for Economics III. 1 Credit Hour.
This is the third in the series of three courses on data and empirical techniques used in economic analysis. The course trains students to routinise their statistical programming and data analysis skills, such as analysis of variance, linear and logistic regression modelling, and evaluating model performance. This course is an ideal complement to Empirical Methods, various thesis-focused and other research-oriented courses.

ECON 4010. Career Development Workshop. 1 Credit Hour.
This workshop style class for economics majors focuses on strategies and skills for identifying career and graduate school pathways, conducting successful job and internship searches, and advancing in the workplace.

ECON 4060. Money and Capital Markets. 3 Credit Hours.
Examines the role of money in macroeconomic activity and the impacts of monetary institutions and policy strategy on the behavior of financial markets and aggregate economic activity.

ECON 4160. Economic Forecasting. 3 Credit Hours.
Surveys modern time series econometrics with topics such as univariate models, vector autoregressions, linear and nonlinear filtering, frequency domain methods, unit roots, structural breaks, empirical process theory asymptotics, and forecasting. The course highlights applications in macroeconomics and finance.

ECON 4170. Mathematics for Economic Modeling. 3 Credit Hours.
Applies mathematical tools to economic analysis. Topics include the uses of linear algebra, multivariable calculus, comparative-static analysis, and optimization in economics.

ECON 4180. Game Theory I. 3 Credit Hours.
Course covers static games of complete information, dynamic games of complete information, static games of incomplete information and dynamic games of incomplete information.

ECON 4190. Game Theory II. 3 Credit Hours.
Students will learn microeconomic theories of strategic decision making by firms and individuals, and how firms and individuals utilize information to interact strategically.

ECON 4210. The Economics of Climate Change. 3 Credit Hours.
This course will explore the economic causes and consequences of climate change and evaluate the suite of policy options to mitigate greenhouse-gas emissions.

ECON 4232. Labor Economics. 3 Credit Hours.
Introduces students to labor markets, government regulations, and the incentives and behavior of workers and firms. Topics include wage discrimination, minimum-wage laws, and unemployment.

ECON 4301. Economics of Information, Transactions Costs, and Contracts. 3 Credit Hours.
Builds from analysis of the individual in a trading or transaction situation to study organizations as groups of affiliated individuals. Assesses the situations when organizations are preferable to markets as forms of organizing economic and social activity. Institutional economics and transaction cost economics are studied. Analysis of corporate restructuring and privatization.

ECON 4311. Strategic Economics for Global Enterprise. 3 Credit Hours.
Analyzes the multinational enterprise from an economic and interdisciplinary perspective. The course focuses on challenges facing multinational enterprises in a fast-paced and global business environment. Students learn to use economic tools to analyze these issues and understand their managerial implications.

ECON 4321. Economics of Technology, Innovation, and Entrepreneurship. 3 Credit Hours.
Analyzes the economics of entrepreneurship and innovation. Topics include the business and economic history of entrepreneurship as well as the legal and institutional framework of the entrepreneurial environment.

ECON 4340. Economics of Industrial Competition. 3 Credit Hours.
This course examines the theory of the firm, the relationship between market structure, practices, and performance, and the determinants of technological change. The role (and ability) of government policy to solve various market failures, via antitrust enforcement, regulation, etc., is also discussed.

ECON 4345. Economic Regulation. 3 Credit Hours.
This course examines how government economically regulates private industry, how it might regulate more efficiently, and when it should not regulate at all. General theories of antitrust enforcement and economic regulation are developed and applied to a variety of industry cases.

ECON 4350. International Economics. 3 Credit Hours.
Covers important topics in trade theory, trade policy, and international finance. The course emphasizes the use of economic tools to analyze a variety of current events in the world economy.

ECON 4351. International Financial Economics. 3 Credit Hours.
This course familiarizes students with concepts, models, theories and applications in international markets.

ECON 4352. International Trade Theory and Policy. 3 Credit Hours.
This course will develop a theoretical framework to understand international trade. Students will examine the possibility of gains from trade, the nature of comparative advantage, the determination of the pattern of trade, the role of scale economies, imperfect competition, and factor movements. Students will examine trade policy, in particular the effects of protection (tariffs and non-tariff barriers) on prices and domestic consumer and producer economic welfare.

ECON 4355. Global Financial Economics. 3 Credit Hours.
Examines the global system of markets and institutions for the exchange of capital, money, and goods. The course studies the impact of globalization on national economies and fundamental economic global relationships.

ECON 4357. Law and Economics of the Global Trading System. 3 Credit Hours.
This course takes an interdisciplinary approach, examining the economics, law, and political economy of the global trading system and its rules and practices. The course reviews the main economic theories behind the existence of tariffs, quotas, subsidies, non-tariff barriers to trade, strategic trade policies, and discusses the basic rules of GATT and World Trade Organization (WTO). Case-study discussions are used to analyze how multinational enterprises (MNEs) alter their strategies and decision-making structures in response to multilateral rules and enforcement mechanisms embodied in the WTO.

ECON 4360. Network Economics. 3 Credit Hours.
Analyzes the telecommunications sector from the public policy, business strategy, and technology perspectives. The course explores the driving forces behind the radical change in telecommunications regulations and the impact of this regulation on business operations.

ECON 4370. Law and Economics. 3 Credit Hours.
To introduce students to economic aspects of legal decision-making and to develop students' ability to critically analyze the purposes and efficiency of legal decision-making from an economic perspective.

ECON 4401. Behavioral Economics. 3 Credit Hours.
Human psychology and the rational choice models of economics are joined to better understand human decision-making. Students will design and execute their own experiments.

ECON 4411. Economic Development. 3 Credit Hours.
Introduces models of economic growth and sustainable development with a focus on inequality and poverty in the national and global context.

ECON 4412. Cost-Benefit Analysis. 3 Credit Hours.
Introduces students to the principles, tools, issues, strengths, and limitations of cost-benefit analysis (CBA). The course prepares students to competently review, criticize, and use CBA studies.

ECON 4415. Conflict and Security in Developing Countries. 3 Credit Hours.
Introduces research on the causes and consequences of contemporary armed conflict as well as economic studies of terrorism.

ECON 4421. Urban and Regional Economics. 3 Credit Hours.
Introduces the economics of regions, cities, and space. Students learn theories of growth and location to analyze the effects of urbanization, agglomeration, and congestion. The course analyzes public policy relating to urban and regional problems.

ECON 4430. Economics of Transportation and Communication Systems. 3 Credit Hours.
Covers fundamentals of transport demand and supply, markets, infrastructure, and transport-related externalities. Empirical case studies explore current topics in transport sectors (e.g. the airline, rail, and highway sectors).

ECON 4440. Economics of Natural Resources and the Environment. 3 Credit Hours.
Explores how economics can address a variety of environmental issues ranging from climate change to local pollution. Topic areas include externalities and the social costs of pollution, valuation of non-market goods, climate change policy (emissions taxes and cap-and-trade), management of renewable resources (fisheries and forests), extraction of exhaustible resources (minerals and fossil fuels), and more. Focuses on global, regional, and local environmental policy.

ECON 4450. Topics in African American Entrepreneurship. 3 Credit Hours.
History and dynamics of African-American business. Impact of racial segregation on business formation. Case studies and empirical exercises.

ECON 4460. Public Economics. 3 Credit Hours.
This course focuses on public goods, how public decisions regarding public goods are made, the "free-rider" problem, voting and taxation principles, welfare, the Tiebout Hypothesis, budgeting, and fiscal policies.

ECON 4510. Economics of Health and Health Care. 3 Credit Hours.
Surveys theoretical and empirical evidence on current issues in health and health care. The course presents individual-level models of health behaviors and the demand for health and medical insurance. Students analyze the economic behaviors of physicians, hospitals, and insurance companies as well as the possible role of government in encouraging the equitable and efficient performance of health markets. The course emphasizes current debates involving individual health decisions, health care reform, and the diffusion of new medical technologies.

ECON 4520. Economics of Sports. 3 Credit Hours.
Uses economic principles from game theory, labor economics, and econometrics to analyze a wide range of issues in the realms of professional sports and collegiate athletics.

ECON 4610. Seminar in Economic Policy. 3 Credit Hours.
The objective of the course is to enable students to interpret current economic problems and policies using the economic models learned in their theory courses. Students study the current "Economic Report of the President" and apply analytical tools to the data included in the text. Each student selects a current issue for detailed examination and report.

ECON 4620. History of Economic Thought. 3 Credit Hours.
This course is concerned with the economists who interpreted and influenced the development of capitalism and socialism over the last two centuries.

ECON 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
This course is for students who want to complete a research assistantship.

ECON 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

ECON 4740. Seminar in Political Economy. 3 Credit Hours.
Capstone experience in which students apply the tools of political economy to international issues. Crosslisted with INTA 4740.

ECON 4741. Thesis in Political Economy. 3 Credit Hours.
Individual project applying the tools of political economy to international issues. Crosslisted with INTA 4741.

ECON 4803. Special Topics in Economics. 3 Credit Hours.
Courses designed to permit students and a professor to pursue a specialized interest in an area of economics not extensively treated in the offerings of the School.

ECON 4811. Special Topics in Economics. 1 Credit Hour.
Courses designed to permit students and a professor to pursue a specialized interest in an area of economics not extensively treated in the offerings of the School.

ECON 4812. Special Topics in Economics. 2 Credit Hours.
Courses designed to permit students and a professor to pursue a specialized interest in an area of economics not extensively treated in the offerings of the School.

ECON 4813. Special Topics in Economics. 3 Credit Hours.
Courses designed to permit students and a professor to pursue a specialized interest in an area of economics not extensively treated in the offerings of the School.

ECON 4814. Special Topics in Economics. 4 Credit Hours.
Courses designed to permit students and a professor to pursue a specialized interest in an area of economics not extensively treated in the offerings of the School.

ECON 4815. Special Topics in Economics. 5 Credit Hours.
Courses designed to permit students and a professor to pursue a specialized interest in an area of economics not extensively treated in the offerings of the School.

ECON 4901. Individual Research in Economics. 1-21 Credit Hours.
Designed to permit independent study with a faculty member.

ECON 4910. Individual Research in Economics. 3 Credit Hours.
Course related to independent student research. Topics determined by instructor and student.

ECON 4990. Internship in Professional Economics. 1-21 Credit Hours.
Course projects related to professional internships. Topics and requirements to be arranged by student, instructor, and sponsor.

ECON 4XXX. Economics Elective. 1-21 Credit Hours.

ECON 6010. Career Development Workshop. 1 Credit Hour.
This workshop style class for economics majors focuses on strategies and skills for identifying career and graduate school pathways, conducting successful job and internship searches, and advancing in the workplace.

ECON 6011. Coding and Data Analysis for Economics I. 1 Credit Hour.
This is the first in the series of three courses on data and empirical techniques used in economic analysis. Data cleaning, data management, and descriptive statistics methods are presented and applied to a variety of economics problems. The course prepares students for extensive use of statistical software to build data management skills and generate reports used in descriptive and explorative data analyses.

ECON 6012. Coding and Data Analysis for Economics II. 1 Credit Hour.
This is the second in the series of three courses on data and empirical techniques used in economic analysis. The course focuses on advanced skills that include large data management and manipulation, relational data management, extensive vertical and horizonal summative and remerging techniques to prepare data sets for advanced statistical and econometric analyses.

ECON 6013. Coding and Data Analysis for Economics III. 1 Credit Hour.
This is the third in the series of three courses on data and empirical techniques used in economic analysis. The course trains students to routinise their statistical programming and data analysis skills, such as analysis of variance, linear and logistic regression modelling, and evaluating model performance. This course is an ideal complement to Empirical Methods, various thesis-focused and other research-oriented courses.

ECON 6100. Economics and Strategy for Managers. 3 Credit Hours.
A survey of microeconomic and macroeconomic concepts essential to the academic preparation of prospective managers. Economic theory used as a framework for contemporary managerial decision making.

ECON 6105. Macroeconomics. 3 Credit Hours.
Macroeconomic theory, including determination of national income, employment, the general price level, and potential for economic growth. Sources of macroeconomic instability and stabilization policies.

ECON 6106. Microeconomic Analysis. 3 Credit Hours.
Microeconomics, resource allocation decisions of households, businesses, and government agencies. Enables the student to understand and apply economic principles to consumer, business, and government decisions.

ECON 6110. Economics of Corporate Strategy. 3 Credit Hours.
Applies microeconomic and macroeconomic theory to the development of modern corporate strategy, including organizational boundaries, market structure and competition, industry analysis, and competitive advantage.

ECON 6121. Research Methods. 3 Credit Hours.
Introduces students to issues related to conducting research in economics. Topics include the derivation of empirical models from theoretical constructs, causality, experimental and non-experimental data, hypothesis testing, and policy analysis. Students also become familiar with electronic data sources and retrieval and are introduced to several professional software packages.

ECON 6130. Quantitative Methods in Economics. 3 Credit Hours.
This course covers fundamental quantitative tools used in economic and econometric analysis, which includes topics in differential calculus, optimization, and linear algebra.

ECON 6140. Econometrics I. 3 Credit Hours.
This course gives students the necessary background for taking courses in the econometrics sequence. Topics include descriptive statistics, continuous and discrete probability distributions, parameter estimation, one- and two-sample hypothesis testing, and bivariate regression models.

ECON 6150. Cost-Benefit Analysis. 3 Credit Hours.
The application of economic, financial, and quantitative reasoning and tools to issues of resource allocation and policy, primarily in the public sector.

ECON 6160. Econometrics II. 3 Credit Hours.
This course introduces advanced econometric methods on estimation and testing, including instrumental variable estimation, panel data analysis, limited dependent variable models, and simultaneous equation system. The course emphasizes applications of these techniques to real-world problems using professional software packages.

ECON 6161. Econometric Modeling and Forecasting. 3 Credit Hours.
This course introduces techniques on economic and business forecasting, focusing on regression analysis and ARIMA models. Testing for unit roots and cointegration are also discussed. Professional software packages for forecasting are used in applications.

ECON 6162. Discrete Choice Econometrics. 3 Credit Hours.
Focuses on econometric methods for which the dependent variable represents an "either-or" choice. Included in the set of topics are binary and multinomial logic, ordered choice, heteroskedastic extreme value, bivariate and multivariate probit, nested logit structures, discrete/continuous, and Poisson models. The course includes numerous applications using professional software programs.

ECON 6200. Money and Capital Markets. 3 Credit Hours.
The role of money in the exchange process, Federal Reserve strategy, and the impact of monetary policy on financial markets and aggregate economic activity.

ECON 6250. Corporate Value Chains and Transfer Pricing. 3 Credit Hours.
We analyze value chains that firms use to globally produce goods, services, and intangibles and apply microeconomic models to price and analyze value chain components.

ECON 6310. Public Economics. 3 Credit Hours.
An examination of public goods, public decision making, voting, free riders, taxation principles, welfare, the Tiebout Hypothesis, budgeting, and fiscal policy.

ECON 6330. Urban and Regional Economics. 3 Credit Hours.
Economics of regions, cities, and space. Theories of growth and location, effects of urbanization, agglomeration, and congestion. Public policy relating to urban and regional problems.

ECON 6341. Transportation Economics. 3 Credit Hours.
Examines the economics of transportation markets, including resource allocation, economic welfare, government regulation, and public policy. Using an econometric case study approach, the course develops the necessary steps for testing hypotheses, analyzing the finding of recent studies, and exploring implications for the development and implementation of transportation policy.

ECON 6360. Development Economics. 3 Credit Hours.
Concepts and models of development and growth in Third World countries, emphasizing modeling and testing of recent changes in the Third World . Topics include economic growth, trade and globalization, poverty and inequity, migration, population growth, unemployment, agricultural development, the environment, and the role of the market versus the state.

ECON 6380. Economics of Natural Resources and the Environment. 3 Credit Hours.
Explores how economics can address a variety of environmental issues ranging from climate change to local pollution. Topic areas include externalities and the social costs of pollution, valuation of non-market goods, climate change policy (emissions taxes and cap-and-trade), management of renewable resources (fisheries and forests), extraction of exhaustible resources (minerals and fossil fuels), and more. Focuses on global, regional, and local environmental policy.

ECON 6431. Strategic Economics for Global Enterprise. 3 Credit Hours.
This course uses economic tools to examine strategic aspects of competition and collaboration in an integrated global market. Topics include the determinants and changes in the boundaries of global firms, competitive advantage and value creation, the nature of global markets, and strategic positioning in the global market place.

ECON 6440. The Economics of Technology, Innovation, and Entrpreneurship. 3 Credit Hours.
This course explores the impact that innovation, technology progress, and R&D activities have upon a firm's pricing and output behavior. Based upon computer case studies, biotechnology, and telecommunications sectors, the course further analyzes the economic role that firm size and entrepreneurial opportunities play in technological development and innovation.

ECON 6450. Topics in African American Entrepreneurship. 3 Credit Hours.
Explores African-American entrepreneurship from the ante-bellum period to the present. Implications of economic and socio-political developments are given particular attention, including the urbanization of blacks, the rise of benevolent societies following slavery, institutionalization of Jim Crow segregation, desegregation, and affirmative action's role in an emerging class of black entrepreneurs.

ECON 6460. Industrial Organization. 3 Credit Hours.
This course examines modern theories of the firm, market power, and competitive strategy. Game theory is employed throughout the course.

ECON 6510. Economics of Health and Health Care. 3 Credit Hours.
A critical survey of the current theoretical and empirical issues involving the economics of health and health care.

ECON 6610. Seminar in Economic Policy. 3 Credit Hours.
Interprets current economic problems and policies using fundamental economic principles.

ECON 6620. History of Economic Thought. 3 Credit Hours.
Economists who interpreted and influenced the development of capitalism and socialism over the last two centuries.

ECON 6650. International Economics and Policy Analysis. 3 Credit Hours.
Explores international economic issues. The first part examines aspects of international trade, including specialization and exchange, strategy, labor and capital movements, preferential trading arrangements, and economic development. The second part analyzes international finance, including exchange rates, open economy macro policies, Eurocurrency markets, and the international monetary system.

ECON 6704. Introduction to Global Development. 3 Credit Hours.
This course introduces students to the goals, theories and key institutional actors involved in the field of Global Development.

ECON 6XXX. Economics Elective. 1-21 Credit Hours.

ECON 7000. Master's Thesis. 1-21 Credit Hours.

ECON 7004. Mathematics for Economists. 3 Credit Hours.
Topics include matrix algebra, limits and open sets, implicit functions and their derivatives, quadratic forms and definite matrices, unconstrained and constrained static optimization, dynamic optimization and economic applications.

ECON 7012. Microeconomic Theory I. 3 Credit Hours.
The topics covered in this course are axiomatic theory of consumer behavior, consumer choice, classical demand theory, aggregate demand, choice under uncertainty, producer theory and partial equilibrium analysis.

ECON 7013. Microeconomic Theory II. 3 Credit Hours.
The subject areas in this course are general equilibrium, welfare economics, externalities, public goods, economics of information and inter-temporal dynamic analysis.

ECON 7015. Game Theory. 3 Credit Hours.
Static and dynamic games of complete and incomplete information, and mechanism design. Economic applications include Cournot, Bertrand and Stackelberg duopolies, voluntary provision of public goods, auctions, procurement contracts and time inconsistency issues.

ECON 7022. Econometrics I. 3 Credit Hours.
This course is a comprehensive introduction to mathematical statistics principles underlying statistical analyses in economics. It covers probability theory, expectation, sampling, asymptotic results, the main families of probability distributions studied in economics, estimation and hypothesis testing.

ECON 7023. Econometrics II. 3 Credit Hours.
Linear and nonlinear regression analyses, hypothesis testing, ordinary and generalized least squares, instrumental variables estimation, the generalized method of moments, the method of maximum likelihood, methods for stationary time series, unit roots and cointegration, and specification testing.

ECON 7025. Empirical Research Methods. 3 Credit Hours.
Topics include up-to-date theory for data analysis, including time series, cross section and panel, and empirical applications using panel data, time series data and cross-sectional data.

ECON 7026. Microeconomet Analysis. 3 Credit Hours.
Focus on empirical microeconometric methods, including binary, multinomial, and ordered response models, and event history models. Topics include sampling, estimation, and model interpretation.

ECON 7031. Microeconomics of Innovation. 3 Credit Hours.
Historical evolution of institutions that promote innovation, knowledge as a public good, prizes and intellectual property rights as incentive mechanisms, models of cumulative innovation, patent and copyright enforcement and litigation, private versus public funding, and the effects introduced by network externalities and globalization issues.

ECON 7032. Macroeconomics of Innovation. 3 Credit Hours.
Macroeconomic factors that lead to technological change, the roles played by technological innovation and knowledge spillovers as promoters of economic growth, and the scope for fiscal and monetary policies to foment research and development and hence economic growth.

ECON 7102. Environmental Economics I. 3 Credit Hours.
Topics include externalities, property rights, incentive design, emission taxes, tradable emission permits, renewable and nonrenewable resources, innovation incentives originating with environmental regulations and globalization, trans-boundary polluntants within and across nations, international environmental agreements, and the globalization impacts on the environment.

ECON 7103. Environmental Economics II. 3 Credit Hours.
Empirical course, built upon the theoretical topics covered in Environmental Economics I. Students are given an in-depth coverage of key empirical papers in environmental economics, either papers that have tested several hypotheses derived from theoretical models or papers that are advancing knowledge in the field, generating empirical results for which no theory yet exists.

ECON 7111. Industrial Organization I. 3 Credit Hours.
Topics include market structures and the strategic behavior of firms (monopoly, oligopoly, imperfect competition), research and development, adoption of new technologies, regulations, procurement, antitrust law and competition policy.

ECON 7112. Industrial Organization II. 3 Credit Hours.
Empirical course that trains students to empirically examine the theoretical issues arising in Industrial Organization I. Students are taught about how to use existing data, collect and compile their own datasets and use frontier methods in empirical Industrial Organization to test hypotheses that originate from the theories related to pricing, product and process innovation, among others.

ECON 7121. International Economics I. 3 Credit Hours.
Topics include Ricardian and Hecksher-Ohlin models, extensions to many goods and factors, trade in intermediate inputs and wages, increasing returns, gains from trade and regional agreements, import tariffs and dumping, import quotas and export subsidies, political economy of trade policy and trade and endogenous growth. It also examines the relationship between international trade, foreign direct investment and technological innovation and diffusion.

ECON 7122. International Economics II. 3 Credit Hours.
Empirical extension of International Economics I, which surveys the empirical literature and presents the key empirical results related to the topics discussed in the theoretical course. It also discusses frontier empirical work in the field, empirical studies that go beyond the testable hypotheses originated with theory.

ECON 7130. Research Development and Presentation Workshop. 3 Credit Hours.
Lecture topics include instructions on writing research papers in Economics and presenting their work. Contents of presentations and research undertaken by students depend on students' research interests. Students receive personalized feedback on research and presentations.

ECON 7131. Development Economics I. 3 Credit Hours.
This course covers important topics in development economics research and policy such as UN sustainable development goals, human resource investments, poverty and inequality, armed conflict and its impact on well-being and household decision-making. The course introduces students to latest theoretical developments as well as to empirical methods used in the field.

ECON 7132. Development Economics II. 3 Credit Hours.
This course covers emerging issues in development economics with a focus on the roles of individuals, families, institutions and policies. The class emphasizes a connection between economic modeling of agents' behavior and relevant empirical methods.

ECON 8801. Special Topics. 1 Credit Hour.

ECON 8802. Special Topics. 2 Credit Hours.

ECON 8803. Special Topics. 3 Credit Hours.

ECON 8910. Special Problems. 1-21 Credit Hours.

ECON 8990. Special Problems. 1-21 Credit Hours.

ECON 8997. Teaching Assistantship. 1-9 Credit Hours.
For graduate students holding teaching assistantships.

ECON 8998. Research Assistantship. 1-9 Credit Hours.
For graduate students holding research assistantships.

ECON 9000. Doctoral Thesis. 1-21 Credit Hours.

English (ENGL)

ENGL 0199. Support for English Composition(co-requsite to accompany ENGL 1101). 2 Credit Hours.
This course provides support for students taking ENGL 1101, reinforces student competencies, develops language skills, and encourages reflection.

ENGL 0989. Foundations for English Composition. 3 Credit Hours.
This course provides development of basic skills used in writing the sentence, paragraph, and short essay. Prepares students for college-level compostition, ENLG 0999, and ENGL 1101.

ENGL 0999. Support for English Composition. 3 Credit Hours.
This course provides support for students taking ENGL 1101, reinforces student competencies, develops language skills, and encourages reflection.

ENGL 1101. English Composition I. 3 Credit Hours.
Develops analytical reading and writing skills through the investigation of methods used in cultural and literary studies and the application of those methods to specific texts.

ENGL 1102. English Composition II. 3 Credit Hours.
Develops communication skills in networked electronic environments, emphasizes interpretation and evaluation of cultural texts, and incorporates research methods in print and on the Internet.

Free Elective (FREE)

FREE 1XXX. Free Elective. 1-21 Credit Hours.

FREE 2XXX. Free Elective. 1-21 Credit Hours.

FREE 3XXX. Free Elective. 1-21 Credit Hours.

FREE 4XXX. Free Elective. 1-21 Credit Hours.

FREE 6XXX. Free Elective. 1-21 Credit Hours.

French (FREN)

FREN 1001. Elementary French I. 3 Credit Hours.
An introduction to the French language and culture of the French-speaking world. Beginning of a survey of basic French grammar and the development of the four language skills of listening, speaking, reading, and writing French. Some aspects of everyday life in the French speaking world will also be introduced. Humanities credit awarded for FREN 1001 upon successful completion of FREN 1002 or FREN 2001.

FREN 1002. Elementary French II. 3 Credit Hours.
The second part of an introduction to the French language and the culture of the French-speaking world. Completion of the survey of basic French grammar and further development of the four language skills. Aspects of everyday life in the French-speaking world will be introduced.

FREN 1813. Special Topics. 3 Credit Hours.
Topics of current interest in French.

FREN 1XXX. French Elective. 1-21 Credit Hours.

FREN 2001. Patterns of French Culture I. 3 Credit Hours.
Proficiency-based introduction to selected sociocultural aspects of France: geography, demography, social institutions, history, art, socioeconomic problems, and current events; incorporates grammar review. Conducted in French.

FREN 2002. Patterns of French Culture II. 3 Credit Hours.
Proficiency-based introduction to selected sociocultural aspects of France: geography, demography, social institutions, history, art, socioeconomic problems, and current events; incorporates grammar review. Conducted in French.

FREN 2005. LBAT French Culture and Language. 6 Credit Hours.
Proficiency-based introduction to sociocultural aspects of the French speaking world. Part of the French intensive summer LBAT program. Admission by application only. Conducted in French.

FREN 2694. Internship Assistantship. 1-21 Credit Hours.
Modern Language Undergraduate Internship for pay for freshmen and sophomores, by permit only. The internship experience must be at a unit or agency approved by the School of Modern Language.

FREN 2695. Undergraduate Internship. 1-21 Credit Hours.
Modern Language Undergraduate Internship for credit for freshmen and sophomores, by permit only. The internship experience must be at a unit or agency approved by the School of Modern Languages.

FREN 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

FREN 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

FREN 2813. Special Topics. 3 Credit Hours.
Topics of current interest in French.

FREN 2XXX. French Elective. 1-21 Credit Hours.

FREN 3000. Survey of French Literature. 3 Credit Hours.
This course introduces students to French literature. Taught in French.

FREN 3001. French Literature from 1800 to 1900. 3 Credit Hours.
Romanticism, the reappearance of lyric poetry, the importance of the individual as opposed to classical anonymity. Realism and naturalism with emphasis on the development of the novel. Conducted in French.

FREN 3002. French Literature from 1900 to Present. 3 Credit Hours.
Exploration of currents in modern prose, poetry, and drama. Conducted in French.

FREN 3004. Drama Workshop. 3 Credit Hours.
Literary and theatrical aspects of French drama are explored through class discussion and performance of selections from contemporary and classical plays.

FREN 3011. France Today I. 3 Credit Hours.
Culture, history, and geography of modern France through lectures, videos, downloads from the Internet, audio recordings, digital media, and class discussions. Short papers treating assigned topics to enhance writing skills. Conducted in French.

FREN 3012. France Today II. 3 Credit Hours.
Culture, history, and geography of modern France through lectures, videos, audio recordings, digital media, and class discussions. Short papers treating assigned topics to enhance writing skills. Conducted in French.

FREN 3014. Introduction to Contemporary France. 3 Credit Hours.
This course will introduce students to issues in contemporary France. Taught in French.

FREN 3015. Social Identities in Contemporary French Culture. 3 Credit Hours.
Analysis of production, reception and perceptions of clashing class identities in France via films, novels, plays, short stories, and newspapers. Conducted in French.

FREN 3017. Paris: Modernity Today. 3 Credit Hours.
This course explores contemporary Paris and its representations in light of its modern history and culture. Taught in French.

FREN 3030. French Phonetics. 3 Credit Hours.
A detailed analysis of the significant features of the French sound system, intonation curves, and graphic representation of individual sounds. Conducted in French.

FREN 3040. Reading and Translation. 3 Credit Hours.
This course will prepare students for the techniques of rapid reading in French, and give them tools to translate and use texts. Taught in French.

FREN 3061. France: Culture, Economy, Commerce I. 3 Credit Hours.
Advanced Business French, overview of French commerce, communications, publicity, various social milieus, and the work place. Taught in French.

FREN 3062. France: Culture, Economy and Commerce II. 3 Credit Hours.
Advanced Business French. Overview of French commerce, communications, publicity, various social milieus, and the work place. Taught in French.

FREN 3110. Comics & Graphic Arts. 3 Credit Hours.
This course studies French comics as a genre and its interrelationships with graphic arts and literature. Conducted in French.

FREN 3120. French Conversation and Culture. 3 Credit Hours.
This class is designed to help students improve their French speaking skills, and use French at an advanced level. Not for beginners. Conducted in French.

FREN 3121. Advanced Composition. 3 Credit Hours.
In-depth study of advanced grammar patterns as used in written expressions. Conducted in French.

FREN 3420. Introduction to Africa. 3 Credit Hours.
This interdisciplinary course will use a variety of approaches to study significant aspects of contemporary Africa's societies, cultures, and representations. Taught in English.

FREN 3500. Field Work Abroad. 1-3 Credit Hours.
This course will focus on theme-based individual projects abroad.

FREN 3501. Sustainable Communities in France. 3 Credit Hours.
Examines social, cultural, artistic and environmental dimensions of sustainability and concepts of identity, diversity, social equity and inclusion/exclusion in the French context. Taught in French.

FREN 3551. French for the Professions I. 3 Credit Hours.
Study aspects of literature, philosophy, culture, geography, history, business, and industry in France and other Francophone countries in these applied-language courses. Taught in French.

FREN 3691. Business Communication and Correspondence in France. 3 Credit Hours.
Refinement of accuracy and flexibility in oral/written expression. Focus on appropriate use of strategies, business negotiation protocols, lexical precision. Incorporates grammar review. Part of the French intensive summer language program. Admission by application only.

FREN 3692. French for Business and Technology I. 3 Credit Hours.
Study of business, technological, and cultural issues, tendencies and patterns of behavior among French-speaking people. Value systems and their manifestations. Part of the French intensive summer language program. Admission by application only.

FREN 3693. French for Business and Technology II. 3 Credit Hours.
Business organizations and use of technology in France. Specialized vocabularies of economics, engineering, and computer science. Attention to geographical and anthropological aspects of selected social and political situations. Part of the French intensive summer language program. Admission by application only.

FREN 3694. French for Business and Technology Abroad. 3 Credit Hours.
Two-week seminar in France highlighting business and technology. Field study of technology firms, economic trends, business institutions, and cultural protocols. Journals and papers assigned. Admission by application only.

FREN 3695. Sustainability in Paris. 3 Credit Hours.
This course examines sustainable development and communities in Paris, France. Topics include urban planning, environmental sustainability, use of energy, and social issues. Taught in French.

FREN 3697. Paris in Cinema/Cinema in Paris. 3 Credit Hours.
This course offers an in-depth look at the history, industry, and scope of French cinema through the myth of Paris in films. Conducted in French.

FREN 3813. Special Topics. 3 Credit Hours.
Permits a group of students and a professor to pursue areas of the French language not covered in other courses in the department.

FREN 3821. Special Topics. 1 Credit Hour.
Topics of current interest in French.

FREN 3822. Special Topics. 2 Credit Hours.
Topics of current interest in French.

FREN 3823. Special Topics. 3 Credit Hours.
Topics of current interest in French.

FREN 3833. Special Topics. 3 Credit Hours.
Topics of current interest in French.

FREN 3XXX. French Elective. 1-21 Credit Hours.

FREN 4001. French Stylistics. 3 Credit Hours.
Advanced study of syntax and semantics, aimed at development of stylistic sensitivity. Analysis of representative literary and current interest texts for practice in conversation and composition. Conducted in French.

FREN 4005. Contemporary French Literature. 3 Credit Hours.
This course will study contemporary French authors and their ideas in context, with a focus on specific authors or texts. Taught in French.

FREN 4011. French Art. 3 Credit Hours.
This course will thematically explore French visual, conceptual, and performance art in the historical, theoretical, and cultural contexts of production and reception.

FREN 4013. French Literature and the Visual Arts. 3 Credit Hours.
This course studies French Literature and its interrelationships with various arts (painting, music, cinema, architecture or opera), often through several periods. Conducted in French.

FREN 4061. French Science and Technology I. 3 Credit Hours.
Introduction to scientific and technical French. Analysis and discussion of scientific and technical material pertaining to current issues in the scientific and technical communities. Background in chemistry, physics, or biology required.

FREN 4064. Sustainability & Development in the Francophone World. 3 Credit Hours.
This course will analyze current sustainability & development issues in the Francophone World and policies initiated to address them. Taught in French.

FREN 4080. Politics and Public Policy in France. 3 Credit Hours.
This course will analyze current issues in French society and the public policies initiated to address them. Taught in French.

FREN 4089. Food, Arts And Media. 3 Credit Hours.
This course will focus on the culture of food in French arts, literature and media, examining its social and symbolic values through the centuries. Taught in French.

FREN 4101. Literature of the Francophone World I. 3 Credit Hours.
Exploration of the literature of the Francophone world. Currents in modern prose, poetry, and drama. Conducted in French.

FREN 4102. Literature of the Francophone World II. 3 Credit Hours.
Continuation of Literature of the Francophone World I. Currents in modern prose, poetry, and drama. Conducted in French.

FREN 4103. Francophone Africa. 3 Credit Hours.
This interdisciplinary course will explore contemporary Francophone Africa and its representations in light of its modern history and culture. Taught in French.

FREN 4105. Francophone Cinema. 3 Credit Hours.
This course will explore through films representations of Francophone regions of the world from Africa to the Caribbean. Taught in French.

FREN 4107. The African Diasporas in France. 3 Credit Hours.
Intercultural class taught in French about the complex nature of the African Diasporas in France from their historical development to our present-day society.

FREN 4110. Gender in French-Speaking Societies. 3 Credit Hours.
Course explores the intersection of gender with French history, politics, ethics, laws, professions, medical fields, social classes, religious, nationalisms, and (perceived) ethnicity. Taught in French.

FREN 4160. Arts and Power in Paris: Architecture, Urban Art, Visual Arts, Literature, and More. 3 Credit Hours.
Explores the relationship between power and the arts throughout the history of Paris in sculpture, architecture, tapestry, songs, painting, literature, photography, etc. Taught in French.

FREN 4200. Introduction to French Philosophy. 3 Credit Hours.
Introduction to major French philosophical texts with an emphasis on post-WWI thinkers (includes Existentialism, Structuralism, Post-Structuralism, Postmodernism, Deconstructionism). Conducted in French.

FREN 4202. Science in the French Imagination. 3 Credit Hours.
This course explores the relationships between literature and science, culture, and technology from the late 18th to the 21st century. Taught in French.

FREN 4241. Migration in French Cinema. 3 Credit Hours.
A topical approach focusing on the major contributions of French cinema and cinematographic aesthetics, from the 1900s to contemporary films. Conducted in French.

FREN 4242. The French New Wave. 3 Credit Hours.
In-depth and concentrated study of French cinema. Particular attention devoted to the French New Wave, the development of film theory and criticism in France. Conducted in French.

FREN 4245. Women in Film. 3 Credit Hours.
This course will explore representations of women in French films and women's roles in the film industry. Taught in French.

FREN 4246. French and Francophone Films and Media. 3 Credit Hours.
This course examines socio-historical, political, economic and cultural issues through films and other media in France and/or the Francophone world. Taught in French.

FREN 4250. Reading Les Miserables. 3 Credit Hours.
This course examines in its entirety the world-famous novel from Victor Hugo: Les Miserables within its artistic and social environments and messages. Taught in French.

FREN 4300. France and Globalization. 3 Credit Hours.
Intercultural class about French attitudes and policies toward globalization as well as France's role in the European Community. Conducted in French.

FREN 4500. Advanced Intercultural Seminar. 3 Credit Hours.
Integrates cross-cultural research and reflection into discussion of current issues in the French-speaking world. Intended for students who have some study-abroad experience in a French-speaking country. Conducted in French.

FREN 4694. Internship Assitantship. 1-21 Credit Hours.
Modern Language Undergraduate Internship for pay for junior and seniors, by permit only. The internship experience must be at a unit or agency approved by the School of Modern Languages.

FREN 4695. French Internship. 1-3 Credit Hours.
Professional experience with a business/organization in which students enhance their language skills and cultural knowledge in French in relation to the practical goals/objectives of the entity.

FREN 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

FREN 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

FREN 4813. Special Topics. 3 Credit Hours.
Topics of interest not covered in the regular course offerings.

FREN 4823. Special Topics. 3 Credit Hours.
Topics of current interest in French.

FREN 4833. Special Topics. 3 Credit Hours.
Topics of current interest in French.

FREN 4901. Special Problems in French. 1-21 Credit Hours.
Provides the special instruction required under special programs.

FREN 4902. Special Problems in French. 1-21 Credit Hours.
Provides the special instruction required under special programs.

FREN 4XXX. French Elective. 1-21 Credit Hours.

FREN 6005. Contemporary French Literature. 3 Credit Hours.
This course will study contemporary French authors and their ideas in context, with a focus on specific authors or texts. Taught in French.

FREN 6011. French Art. 3 Credit Hours.
This course will thematically explore French visual, conceptual, and performance art in the historical, theoretical, and cultural contexts of production and reception.

FREN 6013. Literature & Visual Arts. 3 Credit Hours.
This course examines the relationship between Word and Image (including cinema/ film adaptations, photography, hypertext, graphic design, and diverse artistic genres). Taught in French.

FREN 6064. Sustainability & Development in the Francophone World. 3 Credit Hours.
This course will analyze current sustainability & development issues in the Francophone World, and policies initiated to address them. Taught in French.

FREN 6089. FOOD, ARTS & MEDIA. 3 Credit Hours.
This course will focus on the culture of food in French arts, literature and media, examining its social and symbolic values through the centuries. In French.

FREN 6101. Contemporary Francophone Literature. 3 Credit Hours.
This course will analyze Francophone Literatures produced outside of France since 1960 with a focus on their modern and innovative aspects. Taught in French.

FREN 6103. Francophone Africa. 3 Credit Hours.
This interdisciplinary course will explore contemporary Francophone Africa and its representations in light of its modern history and culture. Taught in French.

FREN 6105. Francophone Cinema. 3 Credit Hours.
This course will explore through films representations of Francophone regions of the world from Africa to the Caribbean. Taught in French.

FREN 6202. SCIENCE IN THE FRENCH IMAGINATION. 3 Credit Hours.
This course explores the relationships between literature and science, culture, and technology from the late 18th to the 21st century. Taught in French.

FREN 6252. French Domestic Internship. 1-3 Credit Hours.
Students complete domestic internships. Conducted in French. Online course.

FREN 6300. France and Globalization. 3 Credit Hours.
Intercultural class about French attitudes and policies toward globalization as well as France's role in the European Community. Conducted in French.

FREN 6500. Intercultural Seminar. 3 Credit Hours.
Integrates cross-cultural research and reflection into discussion of current issues in the French-speaking world. Taught in French.

FREN 6503. Professional Portfolio Development. 3 Credit Hours.
Preparation of a professional portfolio connecting experiences and coursework in the MS program towards career preparation. Conducted in French.

FREN 6510. Applied Language Practicum. 3 Credit Hours.
Students will serve as researchers, student aides and apprentice instructors for any 3/4000-level undergraduate course approved by their adviser and the course.

FREN 6511. Applied Language Practicum Abroad. 3 Credit Hours.
Students serve as researchers and apprentice instructors in the LBAT or other faculty-led overseas language immersion program of the School of Modern Languages.

FREN 6695. French Internship Abroad. 1-3 Credit Hours.
Students complete internships abroad in a French-speaking country. Conducted in French. Online course.

FREN 6696. French Internship Abroad. 1-6 Credit Hours.
Students complete internships abroad in a French-speaking country. Conducted in French. Online course.

FREN 6998. Master's Project. 1-6 Credit Hours.
Optional project course taught in French.

FREN 7000. Master's Thesis. 1-6 Credit Hours.
Optional thesis course.

FREN 8803. Special Topics. 3 Credit Hours.
Topics of current interest not covered in the regular course offerings.

FREN 8901. Special Problems in French. 1-21 Credit Hours.
Provides the special instruction required under special programs.

FREN 8902. Special Problems in French. 1-21 Credit Hours.
Provides the special instruction required under special programs.

FREN 8903. Special Problems in French. 1-21 Credit Hours.
Provides the special instruction required under special programs.

Foreign Studies (FS)

FS 4000. Foreign Studies. 12 Credit Hours.
Course used by students participating in an exchange program with a foreign university.

FS 4003. Foreign Studies. 3 Credit Hours.
Course used by students participating in an exchange program with a foreign university.

FS 4006. Foreign Studies. 6 Credit Hours.
Course used by students participating in an exchange program with a foreign university.

FS 4009. Foreign Studies. 9 Credit Hours.
Course used by students participating in an exchange program with a foreign univeristy.

FS 6000. Foreign Studies. 12 Credit Hours.
Course used by students participating in an exchange program with a foreign university.

FS 6003. Foreign Studies. 3 Credit Hours.
Course used by students participating in an exchange program with a foreign university.

FS 6006. Foreign Studies. 6 Credit Hours.
Course used by students participating in an exchange program with a foreign university.

German (GRMN)

GRMN 1001. Elementary German I. 3 Credit Hours.
An introduction to German language and culture. Beginning of a survey of basic German grammar and the development of the four language skills of listening, speaking, reading and writing. Some aspects of everyday life in the German-speaking world will also be introduced. Humanities credit awarded for GRMN 1001 upon successful completion of GRMN 1002 or 2001.

GRMN 1002. Elementary German II. 3 Credit Hours.
The second part of an introduction to German language and culture. Survey of more basic German grammar and the development of the four language skills of listening, speaking, reading, and writing. Some aspects of everyday life in the German-speaking world will also be introduced.

GRMN 1813. Special Topics. 3 Credit Hours.
Topics of current interest in German.

GRMN 1XXX. German Elective. 1-21 Credit Hours.

GRMN 2001. Intermediate German I. 3 Credit Hours.
Review of basic grammatical concepts and vocabulary build-up. Selected readings, audio and video material on the cultural, historical, and intellectual development of Germany. Teaching and class discussion in German.

GRMN 2002. Intermediate German II. 3 Credit Hours.
Continuation of GRMN 2001.

GRMN 2694. Internship Assistantship. 1-21 Credit Hours.
Modern Language Undergraduate Internship for pay for freshmen and sophomores, by permit only. The internship experience must be at a unit or agency approved by the School of Modern Language.

GRMN 2695. Undergraduate Internship. 1-21 Credit Hours.
Modern Language Undergraduate Internship for credit for freshmen and sophomores, by permit only. The internship experience must be at a unit or agency approved by the School of Modern Languages.

GRMN 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

GRMN 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

GRMN 2813. Special Topics. 3 Credit Hours.
Topics of current interest in German.

GRMN 2XXX. German Elective. 1-21 Credit Hours.

GRMN 3010. Introduction to German Literature. 3 Credit Hours.
Introduction to the periods and genres of German literature from the Middle Ages to modern times. Conducted in German.

GRMN 3011. Germany Today. 3 Credit Hours.
Introduction to current issues in contemporary Germany. Lectures, papers, and class discussions. Conducted in German.

GRMN 3024. Conversation and Composition. 3 Credit Hours.
A combination of conversation, composition, and stylistics, this course is designed to promote listening, speaking, and writing proficiency; expansion of vocabulary; stylistic skills.

GRMN 3026. German Stylistics. 3 Credit Hours.
This course introduces students to stylistic difference and idiomatic usages of German, expands vocabulary, and enlarges upon grammatical and syntactic structures. Taught in German. Credit not allowed for both GRMN 3026 and GRMN 3026.

GRMN 3030. Crossing Borders in Literature & Culture. 3 Credit Hours.
The class examines politics of immigration and integration such as national, geographic, ethnic, race, gender, and sexuality boundaries in literature and film. Taught in German.

GRMN 3055. German Fairy Tales: From the Grimm Brothers to Disney. 3 Credit Hours.
Discussion of socio-historical, cultural, and literary themes in German fairy tales, their place in Western tradition, and their echo in contemporary society. Conducted in German.

GRMN 3071. Introductory Business German I. 3 Credit Hours.
Analysis and discussion of texts and videos pertaining to issues in the current business world. Conducted in German.

GRMN 3110. Television & Electronic Culture. 3 Credit Hours.
This course examines the significance of television, computer games, film and online sites (among other sources) in contemporary German culture. Taught in German.

GRMN 3695. German Business and Technology: Structure, Communication and Correspondence. 3 Credit Hours.
Overview of Germany's business structure, such as industries, service sector, banking system, relation to the European Union, the United States, and the global economy. Site visits. Admission by application only.

GRMN 3696. German Business and Technology: Current Issues. 3 Credit Hours.
Themes oriented toward business German, with emphasis on historical, social, cultural, and political questions pertaining to the development of modern Germany. Admissions by application only.

GRMN 3697. German Business and Technology: Communication. 3 Credit Hours.
Development of language skills through discussions, compositions, journals, oral reports, and presentations. Individual and group projects use interviews, explore German surroundings, and focus on cross-cultural issues. Admission by application only.

GRMN 3813. Special Topics. 3 Credit Hours.
Permits a group of students and a professor to pursue areas of the German language not covered in other courses in the department.

GRMN 3821. Special Topics. 1 Credit Hour.
Topics of current interest in German.

GRMN 3822. Special Topics. 2 Credit Hours.
Topics of current interest in German.

GRMN 3823. Special Topics. 3 Credit Hours.
Topics of current interest in German.

GRMN 3833. Special Topics. 3 Credit Hours.
Topics of current interest in German.

GRMN 3901. Special Problems. 1-21 Credit Hours.
Small group or individual instruction.

GRMN 3XXX. German Elective. 1-21 Credit Hours.

GRMN 4001. Advanced German Grammar. 3 Credit Hours.
Study and practice of advanced grammatical structures for complex communicative settings. Taught in German.

GRMN 4010. Perspectives of German Media. 3 Credit Hours.
A comparison of differences in representation between various German media sources applied towards the development of a critical understanding of media language to influence, persuade, inform and entertain.

GRMN 4012. Typical German Towards a German Identity. 3 Credit Hours.
Images of a nation are composed of characteristic traits, some cliches and stereotypes. This course examines a possible German Identity from a variety of viewpoints: history, geography, linguistics, culture, values and traditions, literature, music and the arts, architecture, film, politics and daily life.

GRMN 4023. Selected Readings in German Literature. 3 Credit Hours.
Study of selected authors, movements, genres, in German literature. Selection varies. Conducted in German.

GRMN 4024. German Film and Literature. 3 Credit Hours.
A survey of German culture and recent past as presented through films and related literary works illuminating Germany's quest for identity since 1945.

GRMN 4025. German Culture & Film. 3 Credit Hours.
This course offers a survey of German Cinema from the 1930s to the 2000s. These films will be analyzed as reflections of the historical, social, and cultural context in which they originated.

GRMN 4026. German Post-Wall Cinema. 3 Credit Hours.
This course offers a cross-section of the most important German films since 1989. Students will analyze the narratives in the context of contemporary German history, society, and culture.

GRMN 4027. Political Songwriting in Germany, 1945 to Present. 3 Credit Hours.
This class offers an overview of political songwriting in Germany (GDR and FRG) between 1945 and the present. Taught in German.

GRMN 4028. Americanization and Anti-Americanism in the Federal Republic of Germany. 3 Credit Hours.
This class surveys the reception of U.S. culture in West Germany from the end of WWII to today. Taught in German.

GRMN 4061. Advanced Business German I. 3 Credit Hours.
Advanced principles of German business organization and language. Taught through the use of reading, audio, and video materials. Conducted in German.

GRMN 4065. The European Union: History, Institutions and Current Issues and Challenges. 3 Credit Hours.
The European Union plays an increasing role in European politics and daily life. This seminar examines the origins of the European Union, its institutions, legal framework, and current topics such as immigration, enlargement, and relationships with other countries. Taught in German.

GRMN 4120. Literary Representations of German History. 3 Credit Hours.
This course examines how literary representation reveals interpretations of historical events and the relationship between history and fiction in selected German history. Taught in German.

GRMN 4126. Advanced Stylistics: Grammar and Discourse. 3 Credit Hours.
This course incorporates study of stylistic difference and idiomatic usages of German, expands vocabulary, and solidifies and enlarges upon grammatical and syntactic structures. Taught in German.

GRMN 4310. Science and Technology in German History and Culture. 3 Credit Hours.
Course surveys the history of science, technology, and industrialization in German-speaking countries, as well as current STEM research in German. Taught in German.

GRMN 4500. Advanced Intercultural Seminar. 3 Credit Hours.
Integrates cross-cultural research and reflection into discussion of current issues Germany. Intended for students who have had some study-abroad experience in Germany. Conducted in German.

GRMN 4691. Berlin: The Capital in the 20th Century. 3 Credit Hours.
By engaging contemporaneous topics in film, literature, photography, etc., students will investigate topics that dominated the different periods of Berlin's turbulent history. Taught in German.

GRMN 4693. Industrial Transformation and German Society/Economy. 3 Credit Hours.
Examination of technological and societal changes resulting from transformation of an industrial area to one dominated by high tech and media industries. Taught in German.

GRMN 4695. German Internship. 1-3 Credit Hours.
Professional experience with a business/organization in which students enhance their language skills and cultural knowledge in German in relation to the practical goals/objectives of the entity.

GRMN 4696. Internship Assistantship. 1-21 Credit Hours.
Modern Language Undergraduate Internship for pay for junior and seniors, by permit only. The internship experience must be at a unit or agency approved by the School of Modern Languages.

GRMN 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

GRMN 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

GRMN 4801. Special Topics. 1 Credit Hour.
Special Topics in German.

GRMN 4813. Special Topics. 3 Credit Hours.
Topics of interest not covered in the regular course offerings.

GRMN 4823. Special Topics. 3 Credit Hours.
Topics of current interest in German.

GRMN 4833. Special Topics. 3 Credit Hours.
Topics of current interest in German.

GRMN 4901. Special Problems in German. 1-21 Credit Hours.
Special problems course for advanced students. Topics to be arranged with instructor.

GRMN 4902. Special Problems in German. 1-21 Credit Hours.
Special problems course for advanced students. Topics to be arranged with instructor.

GRMN 4XXX. German Elective. 1-21 Credit Hours.

GRMN 6001. Advanced German Grammar. 3 Credit Hours.
Study and practice of advanced grammatical structures for complex communicative settings. Taught in German.

GRMN 6010. Perspectives of German Media. 3 Credit Hours.
Studies of various German media sources applied towards the development of a critical understanding of media languages to influence, persuade, inform and entertain. Taught in German.

GRMN 6023. German Literature After 1945. 3 Credit Hours.
This class offers an overview of German literature (GDR and FRG) between 1945 and the present.

GRMN 6026. German Post-Wall Cinema. 3 Credit Hours.
This course focuses on German films since 1989. Students will analyze the narratives in the context of contemporary German history, society, and culture. Taught in German.

GRMN 6027. German Political Songwriting. 3 Credit Hours.
This class offers an overview of political songwriting in Germany (GDR and FRG) between 1945 and the present.

GRMN 6028. Americanization and Anti-Americanism in the Federal Republic of Germany. 3 Credit Hours.
This class surveys the reception of US culture in West Germany from the end of WWII to today. Taught in German.

GRMN 6252. German Domestic Internship. 1-3 Credit Hours.
Students complete domestic internships. Conducted in German. Online course.

GRMN 6310. S&T in German History and Culture. 3 Credit Hours.
Course surveys the history of science, technology, and industrialization in German-speaking countries, as well as current STEM research in German. Taught in German.

GRMN 6500. Intercultural Seminar. 3 Credit Hours.
Integrates cross-cultural research and reflection into discussion of current issues in Germany. Taught in German.

GRMN 6503. Professional Portfolio Development. 3 Credit Hours.
Preparation of a professional portfolio connecting experiences and coursework in the MS program towards career preparation. Conducted in German.

GRMN 6510. Applied Language Practicum. 3 Credit Hours.
Students will serve as researchers, student aides and apprentice instructors for any 3/4000-level undergraduate course approved by their adviser and the course.

GRMN 6511. Applied Language Practicum Abroad. 3 Credit Hours.
Students serve as researchers and apprentice instructors in the LBAT or other faculty-led overseas language immersion program of the School of Modern Languages.

GRMN 6695. German Internship Abroad. 1-3 Credit Hours.
German Internship Abroad.

GRMN 6696. German Internship Abroad. 1-6 Credit Hours.
Students complete internships abroad in a German-speaking country. Conducted in German. Online course.

GRMN 6998. Master's Project. 1-6 Credit Hours.
Optional project course taught in German.

GRMN 7000. Master's Thesis. 1-6 Credit Hours.
Optional thesis course.

GRMN 8803. Special Topics. 3 Credit Hours.
Topics of current interest not covered in the regular course offerings.

GRMN 8901. Special Problems in German. 1-21 Credit Hours.
Provides the special instruction required under special programs.

GRMN 8902. Special Problems in German. 1-21 Credit Hours.
Provides the special instruction required under special programs.

GRMN 8903. Special Problems in German. 1-21 Credit Hours.
Provides the special instruction required under special programs.

Georgia Tech (GT)

GT 4900. Special Problems. 1-21 Credit Hours.
Course of individualized instruction, which will include library, conference, and laboratory investigations.

GT 0900. Challenge Summer Intensive Residential Program: Interpersonal Development Course. 2 Credit Hours.
Challenge is a summer residential program for incoming freshman. This course provides critical skills and competencies for the interpersonal and communication development components of Challenge.

GT 1000. Freshman Seminar. 1 Credit Hour.
Discussion of topics related to academic, social and professional success including learning styles, time management, major and career exploration, leadership and teamwork.

GT 1201. Exploring Grand Challenges. 3 Credit Hours.
A problem-based learning approach to developing problem solving skills for multidisciplinary teams of freshmen to tackle Grand Challenges facing humanity.

GT 1801. Special Topics. 1 Credit Hour.
Discussion of topics related to scholarship, leadership, progress, and service focusing on helping students to make impacts those arenas on and beyond campus.

GT 1900. Re-entry Planning. 1 Credit Hour.
Placeholder for returning student.

GT 2000. Transfer Student Seminar. 1 Credit Hour.
Discussion of topics related to academic, social and professional success including learning styles, time management, major and career exploration, leadership and teamwork.

GT 2100. Seminar on Academic Success. 1 Credit Hour.
This academic skills seminar is designed to help students develop personalized strategies for success within the rigorous academic environment at Georgia Tech. This is a non-credit bearing course which cannot be used toward degree requirements.

GT 2201. Grand Challenges Research Project. 1 Credit Hour.
This course is for participants in year 2 of the Grand Challenges program. Students will organize into small teams of 4-8 student to pursue research and development projects that were approved and funded in year 1. Participating students can also propose new projects.

GT 2202. Grand Challenges Research Project. 2 Credit Hours.
This course is for participants in year 2 of the Grand Challenges program. Students will organize into small teams of 4-8 student to pursue research and development projects that were approved and funded in year 1. Participating students can also propose new projects.

GT 2500. ThinkBig@Tech. 0 Credit Hours.
ThinkBig@Tech are faculty led Living Learning Communities. Students participating in these programs will be engaging closely with faculty. The topic of each Living Learning Community is based on the faculty interests, and students sign up for the one they are interested in.

GT 2694. Undergraduate Internship. 1-21 Credit Hours.
Undergraduate Internship for which the student is paid, Freshmen and Sophomores only.

GT 2801. Special Topics. 1 Credit Hour.

GT 2802. Special Topics. 2 Credit Hours.

GT 2803. Special Topics. 3 Credit Hours.
Special Topics - content varies.

GT 2811. Special Topics. 1 Credit Hour.

GT 2812. Special Topics. 2 Credit Hours.

GT 2813. Transfer Student Seminar. 1 Credit Hour.
Discussion of topics related to the academic and personal transition of new transfer students, including campus resources, major and career exploration, and academic and personal success strategies.

GT 2901. Special Problems. 21 Credit Hours.

GT 3801. Special Topics. 1 Credit Hour.

GT 3803. Special Topics. 3 Credit Hours.

GT 3811. Special Topics. 1 Credit Hour.

GT 3821. Special Topics. 1 Credit Hour.

GT 4100. Fundamentals of Personal Finance. 1 Credit Hour.
This course introduces students to the fundamentals of personal finance and covers a core set of knowledge needed to be financially literate.

GT 4694. Undergraduate Internship. 1-21 Credit Hours.
Undergraduate Internship for which the student is paid, Juniors and Seniors only.

GT 4701. Inventions and Startups. 3 Credit Hours.
The theory and practice of innovation and startup creation.

GT 4801. Special Topics. 1 Credit Hour.

GT 4802. Special Topics. 2 Credit Hours.

GT 4803. Special Topics. 3 Credit Hours.
Special Topics - content varies.

GT 4813. Project in Energy Systems. 3 Credit Hours.
Multidisciplinary project in the area of energy systems. Open to students completing the minor in Energy Systems. Students must have completed or be on track to complete all requriements for the energy systems minor except this course.

GT 4822. Special Topics. 2 Credit Hours.
Special Topics (lab and lecture)

GT 4823. Special Topics - Design. 3 Credit Hours.
Seniors will work in teams to apply a systematic design process to real multidisciplinary problems. Problems selected from a broad spectrum of interest areas, including biomedical, environmental, mechanical, industrial design, electrical and thermal/fluids.

GT 4824. Special Topics. 4 Credit Hours.
Special Topics (lecture and lab)

GT 4833. Special Topics. 3 Credit Hours.
Special Topics course - content varies.

GT 4903. Special Problems. 1-21 Credit Hours.
Multi-disciplined research topic selected in consultation with advisor. A brief description, endorsed by the faculty advisor(s).

GT 6000. Grad Groups Extended Orientation. 1 Credit Hour.
Georgia Tech's extended-orientation program for first-semester graduate students promoting a positive student experience through social interaction, familiarization with campus resources, and peer mentorship.

GT 8801. Special Topics. 1 Credit Hour.
Special Topics for Graduate Level.

GT 8802. Special Topics. 2 Credit Hours.
Special Topics.

Georgia Tech Lorraine (GTL)

GTL 2000. Georgia Tech Lorraine Seminar. 1 Credit Hour.
Seminar discussing aspects of European cities. Part of the Georgia Tech Lorraine summer program.

GTL 6001. GTL-SUPELEC. 1-11 Credit Hours.
GTL - SUPELEC.

GTL 6010. CentraleSupelec. 12 Credit Hours.

GTL 6011. GTL and SUPELEC. 12 Credit Hours.
For students attending both GTL and SUPELEC.

GTL 6012. GTL and ENSAM. 12 Credit Hours.
For students attending both GTL and ENSAM.

GTL 6014. GTL and ENSEA. 12 Credit Hours.
For students attending both GTL and ENSEA.

GTL 6015. GTL and INPL ENSEM. 12 Credit Hours.
For students attending both GTL and INPL ENSEM.

GTL 6016. GTL and INPT ENSEEIHT. 12 Credit Hours.
For students attending both GLT and INPT ENSEEIHT.

GTL 6018. GTL - UTC. 12 Credit Hours.

GTL 6020. GTL-INSA. 12 Credit Hours.
For students attending both GTL and INSA.

GTL 6021. CentraleSupelec. 1-21 Credit Hours.

GTL 6022. ENSTA Bretagne. 12 Credit Hours.

GTL 6023. IMT. 12 Credit Hours.
For Ecoles des Mines(all) + Telecom Sud Paris.

GTL 6024. USTL. 12 Credit Hours.

GTL 6025. GTL and ENSAM. 1-11 Credit Hours.

GTL 6110. GTL - BRESCIA. 12 Credit Hours.

GTL 6114. GTL-UTT. 12 Credit Hours.
For students attending both GTL and UTT (universite de Technologie de Troye)

GTL 6119. GTL-ESIE. 12 Credit Hours.

GTL 6121. GTL and Universite International de Rabat. 12 Credit Hours.

Hindi (HIN)

HIN 1001. Elementary Hindi I. 3 Credit Hours.
This first introductory Hindi course teaches basic grammar and develops listening, speaking, reading, and writing skills. Taught in Hindi. No native speakers allowed.

HIN 1002. Elementary Hindi II. 3 Credit Hours.
A continuation to HIND 1001, this course teaches basic grammar and develops listening, speaking, reading, and writing skills. Taught in Hindi. No native speakers allowed.

HIN 1501. Heritage Hindi I. 3 Credit Hours.
For heritage students in the U.S. who have never studied Hindi formally, but who speak some Hindi.

HIN 1801. Special Topics. 1 Credit Hour.
Topics of current interest in Hindi languages.

HIN 1803. Special Topics. 3 Credit Hours.
Topics of current interest in Hindi languages.

HIN 1804. Special Topics. 4 Credit Hours.
Topics of current interest in Hindi languages.

HIN 1813. Special Topics. 3 Credit Hours.
Topics of current interest in Hindi languages.

HIN 1814. Topics of current interest in Hindi Languages.. 4 Credit Hours.
Topics of current interest in Hindi Languages.

HIN 1823. Special Topics. 3 Credit Hours.
Topics of current interest in Hindi languages.

HIN 1824. Topics of current interest in Hindi Languages.. 4 Credit Hours.
Topics of current interest in Hindi Languages.

HIN 2001. Intermediate Hindi I. 3 Credit Hours.
Review of basic grammatical concepts: conversational, reading, and writing activities; cultural aspects of the Hindi world.

HIN 2501. Heritage Hindi II. 3 Credit Hours.
The continuation of HIN 1501 or for intermediate-level heritage students in the U.S. who can communicate some in Hindi, but cannot read or write it for academic purposes. Taught in Hindi.

HIN 2694. Internship Assistantship. 1-21 Credit Hours.
Modern Language Undergraduate Internship for pay for freshmen and sophomores, by permit only. The internship experience must be at a unit or agency approved by the School of Modern Language.

HIN 2695. Undergraduate Internship. 1-21 Credit Hours.
Modern Language Undergraduate Internship for credit for freshmen and sophomores, by permit only. The internship experience must be at a unit or agency approved by the School of Modern Languages.

HIN 2813. Topics of current interest in Hindi Languages.. 3 Credit Hours.
Topics of current interest in Hindi Languages.

HIN 3813. Topics of current interest in Hindi Languages.. 3 Credit Hours.
Topics of current interest in Hindi Languages.

HIN 3823. Special Topics. 3 Credit Hours.
Topics of current interest in Hindi languages.

HIN 3833. Special Topics. 3 Credit Hours.
Topics of current interest in Hindi languages.

HIN 3XXX. Hindi Elective. 1-21 Credit Hours.

HIN 4694. Internship Assistantship. 1-21 Credit Hours.
Modern Language Undergraduate Internship for pay for junior and seniors, by permit only. The internship experience must be at a unit or agency approved by the School of Modern Languages.

HIN 4813. Topics of current interest in Hindi Languages.. 3 Credit Hours.
Topics of current interest in Hindi Languages.

HIN 4823. Special Topics. 3 Credit Hours.
Topics of current interest in Hindi languages.

HIN 4833. Special Topics. 3 Credit Hours.
Topics of current interest in Hindi languages.

HIN 8803. Special Topics. 3 Credit Hours.
Special Topics in Hindi Language and Literature.

History (HIST)

HIST 2111. The United States to 1877. 3 Credit Hours.
Colonial settlement, the American Revolution and the Constitution, antebellum expansion, slavery and plantation economy, sectional conflict and Civil War, Reconstruction. Includes study of Georgia history during this period.

HIST 2112. The United States since 1877. 3 Credit Hours.
The social, political, and economic history of the United States since Reconstruction. Topics include American industrialization, two world wars, New Deal, and the Civil Rights movement. Includes study of Georgia history during this period.

Health Systems (HS)

HS 4001. Introduction to Health Systems. 3 Credit Hours.
Background of U.S. healthcare; the workforce; mechanisms and costs of delivery; facilities; ambulatory care; regulation and quality; managed care, finance, and role of government.

HS 6000. Introduction to Healthcare Delivery. 3 Credit Hours.
Historical background; the healthcare workforce; nature, problems, and costs of delivery sites; health planning, finance, role of government, alternative delivery models, and health policy.

HS 6100. Healthcare Delivery Systems Models. 3 Credit Hours.
Progression in service delivery from individual providers to complex financing and delivery organizations. Alternative models are explored with an emphasis on access, efficiency, and effectiveness.

HS 6200. Healthcare Financial Management. 3 Credit Hours.
Applications of accounting and finance in the healthcare delivery system; methods of reimbursement, product costing, strategic financial planning, and capital formation.

HS 6300. Healthcare Information Systems. 3 Credit Hours.
Application of information systems to assist in medical practice including communication within the healthcare enterprise, reimbursement for care, clinical decision making, and assessment of outcomes.

HS 6400. Health Systems Practice. 3 Credit Hours.
An actual project conducted by individual graduate students within a healthcare institution or a health service organization. Project has both a faculty and site sponsor.

HS 6XXX. Health Systems Elective. 1-21 Credit Hours.

HS 8803. Special Topics. 3 Credit Hours.
Topics of current interest in health systems.

HS 8811. Special Topics. 1 Credit Hour.

HS 8813. Special Topics. 3 Credit Hours.
Topics of current interest in health systems.

HS 8900. Special Problems. 1-21 Credit Hours.

HS 8901. Special Problems. 1-21 Credit Hours.

HS 8997. Teaching Assistantship. 1-9 Credit Hours.
For graduate students holding graduate teaching assistantships.

HS 8998. Research Assistantship. 1-9 Credit Hours.
For graduate students holding graduate research assistantships.

History, Technology & Society (HTS)

HTS 1001. Introduction to History, Technology, and Society. 3 Credit Hours.
An introduction to classic texts, key concepts, and research opportunitites in history and sociology.

HTS 1031. Europe Since the Renaissance. 3 Credit Hours.
Social, political, economic, and cultural history of Europe since the Renaissance. Topics include Renaissance; Reformation; political, scientific, and industrial revolutions; nationalism; fascism and communism; decolonization.

HTS 1081. Engineering in History. 3 Credit Hours.
Uses historical case studies to examine the relationship between engineers and the larger society in which they function. Often taught jointly with engineering faculty.

HTS 1XXX. History, Technology, & Society Elective. 1-21 Credit Hours.

HTS 2001. Early American History. 3 Credit Hours.
North America to 1763, including native cultures, contacts with European colonizers, settlement strategies and patterns, and foundation of American political and economic institutions.

HTS 2002. The American Revolution and Constitution. 3 Credit Hours.
The American Revolution as political debate, war, and social upheaval, with attention to the framing and ratification of the Constitution.

HTS 2006. History of the Old South to 1865. 3 Credit Hours.
A study of social, political, and economic developments in the South from the colonial period through the Civil War.

HTS 2007. History of the New South since 1865. 3 Credit Hours.
An examination of social, political, and economic developments from the Reconstruction period to the present.

HTS 2011. The Gilded Age and the Progressive Era. 3 Credit Hours.
Populism, the currency question, immigration, the rise of big business, war, and reform in one of the most turbulent periods of American history.

HTS 2013. Modern America: World War II and After. 3 Credit Hours.
Dawning of the atomic age, anticommunism, the Civil Rights Movement, New Frontier and Great Society, Vietnam and the tumultuous 1960s, and end of Cold War.

HTS 2015. History of Sports in America. 3 Credit Hours.
Examines American sport from colonial to contemporary times. Focuses on the rise of organized sports and the influence of race, class, gender, and ethnicity.

HTS 2016. Social Issues and Public Policy. 3 Credit Hours.
Draws on sociological theory and research to understand the major economic, social, and cultural issues facing American society today.

HTS 2017. Environmental Sociology. 3 Credit Hours.
This course examines theories about how human society impacts the natural world through economic, political, and social systems.

HTS 2018. Food and Society. 3 Credit Hours.
Survey of the complex social web of identity, culture, politics, economics, history, and power behind food systems in the U.S. and globally.

HTS 2036. Revolutionary Europe: 1789-1914. 3 Credit Hours.
Industrialization and political revolution, the development of political ideologies and labor activism, modern nation-state building, and imperialism from the French Revolution to World War I.

HTS 2037. Twentieth Century Europe: 1914 to Present. 3 Credit Hours.
Global war and the Bolshevik Revolution, rise and fall of Mussolini and Hitler, Stalinism, the Holocaust, Cold War, decolonization, and the movement toward European integration.

HTS 2040. History of Islamic Societies. 3 Credit Hours.
Survey of Middle East from pre-Islamic times to Ottoman rule, tracing the development of Islamic society and emphasizing the plurality of culture in the region.

HTS 2041. History of the Modern Middle East. 3 Credit Hours.
The transformation of the Middle East in the modern era and the relationship of the "East" and "West" in the contemporary world.

HTS 2051. Colonial Latin America and the World. 3 Credit Hours.
An exploration of colonial Latin America from the perspective of Global History.

HTS 2052. North American Borderlands. 3 Credit Hours.
Introduction to the history of early Florida, Georgia, Louisiana, Texas, New Mexico, Arizona and California in the Spanish Colonial period.

HTS 2053. Modern Latin American History. 3 Credit Hours.
Introduces students to the socioeconomic, political, cultural, and environmental conditions that have shaped life in Latin America from the 1800s to the present.

HTS 2061. Traditional Asia and Its Legacy. 3 Credit Hours.
Civilizations of East Asia up to 1850, emphasizing traditional cultures in China and Japan, including religion, science, formation of empires, social life, and commerce.

HTS 2062. Asia in the Modern World. 3 Credit Hours.
Civilizations of India, China, and Japan since 1600, emphasizing Western impact and adaptation of these countries' political, economic, and social systems.

HTS 2080. Introduction to the History of Disease and Medicine. 3 Credit Hours.
Introduction to the history of disease and medicine since the Renaissance focusing on infectious diseases, the rise of germ theory, and evolution of medical training. Cerdit not allowed for both HTS 2080 and HTS 3087.

HTS 2081. The Scientific Revolution. 3 Credit Hours.
A critical approach to the Scientific Revolution, introducing students to primary documents and images from the period and emphasizing interpretive strategies and methods.

HTS 2082. Technology and Science in the Industrial Age. 3 Credit Hours.
Surveys major developments in technology and science since 1600 and places them in the broader social context of their times.

HTS 2084. Technology and Society. 3 Credit Hours.
Analyzes social conditions that promote or retard technological activity, emphasizing role of business, the state, and scientific and engineering professions, and the emergence of consumerism.

HTS 2085. Reel History I: US History through Hollywood Films. 3 Credit Hours.
Students evaluate films as sources for specific historical events by viewing films, reading historical documents, and applying critical analysis to written assignments and class discussions.

HTS 2086. Semester in the City: Engaging Communities. 3 Credit Hours.
Explores how urban neighborhoods work focusing on Westside neighborhoods from a variety of perspectives. Students will work with residents in designing a sustainability project.

HTS 2100. Sci, Tech & Modern World. 3 Credit Hours.
An introduction to perspectives on how developments in science and technology at once reflect and influence politics and society on a global scale.

HTS 2101. Historical and Social Research. 3 Credit Hours.
Interdisciplinary survey based on critical readings of the methods historians and social scientists use to generate knowledge about social life. Students engage in "hands-on" research.

HTS 2694. HTS Internship - Paid. 1-12 Credit Hours.
Undergraduate internship for which the student is paid and receives audit credit. Freshmen and sophomores only.

HTS 2695. HTS Internship-Credit. 1-12 Credit Hours.
Unpaid undergraduate internship for which the student receives pass/fail credit. Freshmen and sophomores only.

HTS 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

HTS 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

HTS 2801. Special Topics. 1 Credit Hour.

HTS 2803. Special Topics. 3 Credit Hours.
Allows a group of students and a professor to study topics not covered in other courses in the department.

HTS 2813. Special Topics. 3 Credit Hours.
Allows a group of students and a professor to study topics not covered in other courses in the department.

HTS 2823. Special Topics. 3 Credit Hours.
Allows a group of students and a professor to study topics not covered in other courses in the department.

HTS 2927. Special Problems. 1-21 Credit Hours.

HTS 2928. Special Problems. 1-21 Credit Hours.

HTS 2929. Special Problems. 1-21 Credit Hours.

HTS 2XXX. History, Technology, & Society Elective. 1-21 Credit Hours.

HTS 3001. American Economic History. 3 Credit Hours.
U.S. economic history since 1607, including regional specialization, agriculture, industrialization, technology, government and economy, money and banking, labor, international trade, and contemporary economic problems.

HTS 3002. History of American Business. 3 Credit Hours.
Evolution of business institutions from colonial period to present, including entrepreneurship, business-government relations, institutional innovation, and twentieth century managerial capitalism.

HTS 3003. Sociology of Economic Institutions. 3 Credit Hours.
Examines links between economic structures-markets, regulatory bodies, and labor relations systems-and the wider structural and cultural context.

HTS 3005. American Environmental History. 3 Credit Hours.
Transformation of the North American environment since 1500, including different notions of nature, romantic responses to wilderness during industrialization, rise of conservation movements, and environmental policy.

HTS 3006. United States Labor History. 3 Credit Hours.
The changing nature of work and labor relations, with focus on unionization and government regulation, and equity issues in the workplace.

HTS 3007. Sociology of Work, Industry, and Occupations. 3 Credit Hours.
Analyzes paid employment as a decisive social attachment, emphasizing work organizations, technological change and authority relations, and social inequality among diverse groups of employees.

HTS 3008. Class, Power, and Social Inequality. 3 Credit Hours.
This course examines how social class and the market economy affect inequality and stratification in the U.S., with additional attention to the roles of race and gender.

HTS 3009. The American Civil War. 3 Credit Hours.
Social, economic, political, and military aspects of the Civil War, including causes of the war, military campaigns, and long-term consequences.

HTS 3011. The City in American History. 3 Credit Hours.
Examines the historical background of the American city since colonial times, including city planning, urban technology and services, neighborhoods, and race relations.

HTS 3012. Urban Sociology. 3 Credit Hours.
Sociological perspectives on the city, urbanization, and problems of community, evolution of cities and problems of urban life in the United States and Third World.

HTS 3015. History of the Vietnam War. 3 Credit Hours.
Diplomatic, military, and social aspects of America's war in Vietnam, including antiwar protests, the defense industry boom, and the war's enduring impact on American life.

HTS 3016. Women and Gender in the United States. 3 Credit Hours.
Course examines themes and theories of women's and gender history since the colonial period, including work, family, race, sexuality, and politics.

HTS 3017. Sociology of Gender. 3 Credit Hours.
Gender as a dimension of social life that shapes and is shaped by the economy, schooling, family, politics, medicine and health, race, and social class.

HTS 3018. New Religions and Cults in America. 3 Credit Hours.
Explores controversial and influential new religious movements and cults in America, focusing on their origin, appeal, and impact.

HTS 3019. The Family, Sexuality, and Social Change in America. 3 Credit Hours.
Changing patterns of family life and sex roles since colonial times, with a focus on mainstream ideals, utopian alternatives, and social criticism.

HTS 3020. Gender and Technology. 3 Credit Hours.
Course examines the ways in which the design, development, and application of technologies, as well as cultural responses to them, have been gendered historically.

HTS 3021. Women in Science and Engineering. 3 Credit Hours.
Women in science and engineering and gender differences in participation, location, and status. Examines education, access, and apprenticeship, culture of science and engineering.

HTS 3022. Gender and Sports. 3 Credit Hours.
Examines how gender norms and beliefs shape sport structures, participation opportunities and experiences in American sport.

HTS 3023. Slaves without Masters: Free People of Color before 1865. 3 Credit Hours.
Free people of color during the era of slavery, including everyday life, political and social philosophies, literature, community development, and movements for social change.

HTS 3024. African American History to 1865. 3 Credit Hours.
The experience of African and African American people in North America from the beginnings of slavery until the era of emancipation in the Civil War.

HTS 3025. African American History since 1865. 3 Credit Hours.
The African American experience since 1865, including Reconstruction, segregation, the African American family, the Harlem Renaissance, the Civil Rights Movement, and Black Power.

HTS 3026. Sociology of Race and Ethnicity. 3 Credit Hours.
Nature and significance of dominant/minority relations, including legacies of colonialism and slavery, roots of residential segregation, and effects of race on American politics.

HTS 3027. The Civil Rights Movement. 3 Credit Hours.
Examines why the civil rights movement emerged, how it was successful, and the impact it had on the U.S.

HTS 3028. Ancient Greece: Gods, Heroes, and RuinS. 3 Credit Hours.
Classical Athens and Sparta, myths and legends in historical context. Course ends with Alexander the Great and the rise of Rome.

HTS 3029. Ancient Rome: From Greatness to Ruins. 3 Credit Hours.
Growth of the Republic, antics and follies of the emperors, accomplishments of Rome, and causes of decline. Early Christianity and its impact on Europe included.

HTS 3030. Medieval Europe: 350 to 1400. 3 Credit Hours.
The rise of barbarian kingdoms from Rome's ashes, the explosion of Islam, the monastic movement, Charlemagne's empire, the blossoming of medieval culture, and developinG European monarchies.

HTS 3031. European Labor History. 3 Credit Hours.
The labor movement from 1700s to the present, including an examination of Marx and socialism, unionization, and work conditions, especially in Britain, Germany, and France.

HTS 3032. Modern European Intellectual History. 3 Credit Hours.
Introduction to intellectual problems and trends in modern Europe, including loss of faith in progress, evil and ethics, post-colonialism, feminism, linguistics, and psycho-analytic thought.

HTS 3033. Medieval England. 3 Credit Hours.
Political, economic, and cultural development of England during the Middle Ages (c. 350-1400). Myths and legends of Stonehenge, the Druids, and King Arthur's Camelot explored.

HTS 3035. Britain from 1815-1914. 3 Credit Hours.
Developments in nineteenth-century Britain, including the industrial revolution, the growth of political democracy, imperialism, and movements for Irish Home rule and democratic socialism.

HTS 3036. Britain Since 1914. 3 Credit Hours.
Britain's experience of two world wars, the growth of Labour and decline of the Liberals, the Welfare State, Thatcherism, and Tony Blair's "New Labour".

HTS 3038. The French Revolution. 3 Credit Hours.
Economic, intellectual, and cultural causes of the French Revolution, Jacobinism and the Terror, careers of Robespierre and Danton, and rise and fall of Napoleon's empire.

HTS 3039. Modern France. 3 Credit Hours.
France from 1815 to 1968, emphasizing the continuing project of creating France as a powerful nation within the context of global culture and politics.

HTS 3041. Modern Spain. 3 Credit Hours.
Resistance to Napoleon, deformed industrialization, Anarchist and fascist experiments form the background for Spain's transition from dictatorship to democracy after Franco's death.

HTS 3043. Modern Germany. 3 Credit Hours.
Consolidation of Germany since Napoleonic wars, Germany's contributions both hideous and glorious to Europe and the West, and recent unification of East and West Germany.

HTS 3045. Nazi Germany and the Holocaust. 3 Credit Hours.
Genocide in the twentieth century, emphasizing the extermination of European Jews. Course investigates roots of racism, eugenics, and ideologies of genocide in comparative perspective.

HTS 3046. Science, Poliltics, and Culture in Nazi Germany. 3 Credit Hours.
Examines the social, political and cultural context of science and technology in Nazi Germany to understand the interaction of science and politics under totalitarian regimes.

HTS 3048. Modern Russian History and Society. 3 Credit Hours.
Provides an overview of Russian history during the 20th Century. Special emphasis will be on the Soviet period of Russian history from 1917-1991.

HTS 3051. Women and the Politics of Gender in the Middle East. 3 Credit Hours.
The role of women in imperial, nationalist, and Islamist political programs in the Middle East and the impact of politics on women's lives.

HTS 3055. Globalization in the Modern Era. 3 Credit Hours.
This course examines the process of globalization and global change in the twentieth century. Also offers a critical examination of various theories of globalization.

HTS 3061. Modern China. 3 Credit Hours.
The decline of Confucian order, the impact of the West, changes and continuities of Chinese culture, the Communist revolution, nationalism, and economic reforms since 1978.

HTS 3062. Modern Japan. 3 Credit Hours.
Japan's transformation in one century from a feudal state into an economic superpower and the impact of these changes on the Japanese people.

HTS 3063. Outposts of Empire: Comparative History of British. 3 Credit Hours.
Analysis of four British settlement colonies-Australia, New Zealand, Canada, and South Africa-emphasizing settlement, race relations, and national identity.

HTS 3064. Sociology of Development. 3 Credit Hours.
Course examines competing perspectives on international development and surveys some of the crucial issues, including political instability, facing the Third World today.

HTS 3065. History of Global Societies. 3 Credit Hours.
Examines the historical patterns of interaction and inter- dependence between world regions, from approximately the 13th century to global interdependence to the contemporary world.

HTS 3066. Sociology of Politics and Society. 3 Credit Hours.
Political sociology studies the way power is distributed in society. This course takes a comparative and historical approach, focusing on the development of the nation-state.

HTS 3067. Revolutionary Movements in the Modern World. 3 Credit Hours.
Comparative analysis of the origin, development, and impact of major twentieth century revolutionary movements.

HTS 3068. Social Movements. 3 Credit Hours.
Why do social movements emerge? Why might they succeed? This course examines how ordinary people challenge powerful segments of society and contribute to social change.

HTS 3069. Modern Cuba. 3 Credit Hours.
Cuba since 1492 emphasizing slavery and sugar, wars of independence, the revolution of 1959, and the regime of Fidel Castro.

HTS 3070. Culture and Society. 3 Credit Hours.
Covers core issues in the study of culture. Focuses on key sites, social practices, and institutions. Topics include education, medicine, consumption, and the mass media.

HTS 3071. Sociology of Crime. 3 Credit Hours.
This course examines the theories and issues such as perceptions of crime and criminals, characteristics of offenders and victims, and how crime is studied.

HTS 3072. Sociology of Education. 3 Credit Hours.
Examines sociological perspectives on how individual, school, and social factors influence students and teachers. Particular attention is paid to gender, race, ethnicity, and social class.

HTS 3073. Sociology of Sports. 3 Credit Hours.
Examines what constitutes "sports," and uses sociological lens to study sports relationship to education, policy, media, deviance, violence as well as gender, race and class.

HTS 3075. Foundations of Sports Studies. 3 Credit Hours.
Offers case studies of the multidisciplinary study of sports using the lenses of history, sociology, economics, science and technology to understand sports practices and controversies.

HTS 3076. History of Intelligence and National Security. 3 Credit Hours.
Examines the Cold War's most important spy cases and operations to better understand the interplay between the world of secrets and intelligence and the world of statecraft and technology.

HTS 3080. History of Rocketry. 3 Credit Hours.
Examines the history of rocketry, scientists, and organizations in the US, USSR, and Europe during the twentieth century.

HTS 3081. Technology and the Environment. 3 Credit Hours.
Examines how technology affected the environment during the 20th Century, with special attention to issues like industrialization, pollution, overcrowding, and the biotech revolution.

HTS 3082. Sociology of Science. 3 Credit Hours.
The growth of science, its social structure; deviance and norms, the social context of scientific knowledge and practice, and science policy. Credit not allowed for both HTS 3082 and HTS 6115.

HTS 3083. Technology and the Shaping of American Society. 3 Credit Hours.
The complex interplay between technical innovation and cultural change in the United States since 1850, with emphasis on the emergence of modern consumer-oriented society.

HTS 3084. Culture and Technology. 3 Credit Hours.
Modernism and post-modernism: this course investigates culturally creative responses to modern manufacturing, transportation (trains, cars, airplanes), evolving gender ideals, and new communications.

HTS 3085. Law, Technology, and Politics. 3 Credit Hours.
Examines the ways in which courts, legislatures, and regulatory agencies have responded to challenges posed by new technology and shaped the course of technical change.

HTS 3086. Sociology of Medicine and Health. 3 Credit Hours.
Relationship between health and society, including health care problems in the United States and culture's role in defining health and sickness and in determining appropriate therapies.

HTS 3087. History of Medicine. 3 Credit Hours.
An introduction to historical perspectives on the development of medicine, and its relationship to health, illness, and society. Credit not allowed for both HTS 3087 and HTS 2080.

HTS 3088. Race, Medicine & Science. 3 Credit Hours.
Examines how race is an issue in medicine and science in ways such as education, professions, treatments, experiments, and as a subject of analysis.

HTS 3089. Sceince, Technology and Sports. 3 Credit Hours.
This course examines what constitutes a "sport," debates on the role of social inequality in sports, and the intersection of science, technology and sport.

HTS 3100. Introduction to Museum Studies. 3 Credit Hours.
Covers theoretical and practical issues in museum studies, including the role of material culture in scholarly work, registration of artifacts, exhibit design, and public relations.

HTS 3102. Social Theory and Social Structure. 3 Credit Hours.
Introduction to social theory, providing students with skills for reading theory and examining works of major social theorists, including Marx, Weber, Durkheim, Gilman, and Bourdieu.

HTS 3103. Honor's Thesis. 4 Credit Hours.
This course is designed to allow honor's students to distinguish themselves by producing a significant, original research paper.

HTS 3801. Special Topics. 1 Credit Hour.
Special Topics in HTS.

HTS 3803. Special Topics. 3 Credit Hours.
Allows a group of students and a professor to study topics not covered in other courses in the department.

HTS 3813. Special Topics. 3 Credit Hours.
Allows a group of students and a professor to study topics not covered in other courses in the department.

HTS 3823. Special Topics. 3 Credit Hours.
Allows a group of students and a professor to study topics not covered in other courses in the department.

HTS 3XXX. History, Technology, & Society Elective. 1-21 Credit Hours.

HTS 4001. Seminar in United States History. 4 Credit Hours.
Advanced undergraduate topics in U.S. history. Designed for HTS majors, but open to other students with junior or senior standing.

HTS 4011. Seminar in Sociology. 4 Credit Hours.
Advanced undergraduate topics in sociology. Designed for HTS majors, but open to other students with junior or senior standing.

HTS 4031. Seminar in European History. 4 Credit Hours.
Advanced undergraduate topics in European history. Designed for HTS majors, but open to other students with junior or senior standing.

HTS 4061. Seminar in Asian History. 4 Credit Hours.
Advanced undergraduate topics in Asian history. Designed for HTS majors, but open to other students with junior or senior standing.

HTS 4081. Seminar in History of Technology. 4 Credit Hours.
Advanced undergraduate topics in the history of technology. Designed for HTS majors, but open to other students with junior or senior standing.

HTS 4086. Seminar in Health, Medicine, and Society. 4 Credit Hours.
Advanced undergraduate topics in health and medicine. Designed for HTS majors and HMS minors, but open to other students with junior or senior standing.

HTS 4091. Seminar in Global Issues. 4 Credit Hours.

HTS 4694. HTS Internship-Paid. 1-12 Credit Hours.
Undergraduate internship for which the student is paid and receives audit credit. Juniors and seniors only.

HTS 4695. HTS Internship-Credit. 1-12 Credit Hours.
Unpaid undergraduate internship for which the student receives pass/fail credit. Juniors and seniors only.

HTS 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

HTS 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

HTS 4811. Special Topics. 1 Credit Hour.
Topics of interest not covered in the regular course offering.

HTS 4812. Special Topics. 2 Credit Hours.
Topics of interest not covered in the regular course offerings.

HTS 4813. Special Topics. 3 Credit Hours.
Topics of interest not covered in the regular course offerings.

HTS 4814. Special Topics. 4 Credit Hours.
Topics of current interest not covered in the regular course offerings.

HTS 4815. Special Topics. 5 Credit Hours.
Topics of interest not covered in the regular course offerings.

HTS 4823. Special Topics. 3 Credit Hours.
Allows a group of students and a professor to study topics not covered in other courses in the department.

HTS 4833. Special Topics. 3 Credit Hours.
Allows a group of students and a professor to study topics not covered in other courses in the department.

HTS 4843. Special Topics. 3 Credit Hours.
Allows a student and a professor to study topics not included in other courses in the department.

HTS 4925. Special Problems in History, Technology, and Society. 1-21 Credit Hours.
Individual studies of topics of current interest in history, technology, and society.

HTS 4926. Special Problems in History, Technology, and Society. 1-21 Credit Hours.
Individual studies of topics of current interest in History, Technology, and Society.

HTS 4927. Special Problems in History, Technology, and Society. 1-21 Credit Hours.
Individual studies of topics of current interest in History, Technology, and Society.

HTS 4928. Special Problems in History, Technology, and Society. 1-21 Credit Hours.
Individual studies of topics of current interest in History, Technology, and Society.

HTS 4929. Special Problems in History, Technology, and Society. 1-21 Credit Hours.
Individual studies of topics of current interest in History, Technology, and Society.

HTS 4XXX. History, Technology, & Society Elective. 1-21 Credit Hours.

HTS 6001. Proseminar in Social Theory. 3 Credit Hours.
An introduction to key theoretical traditions in modern social theory, including both classical and contemporary works.

HTS 6002. Proseminar in the History of Technology. 3 Credit Hours.
Identifies major areas of interest in the history of technology and introduces a variety of approaches to the discipline.

HTS 6101. Social and Political History of the United States. 3 Credit Hours.
Examines the social experiences of Americans and the political contexts in which they lived.

HTS 6102. Social and Political History of Europe. 3 Credit Hours.
Classic works and debates in European social history, including transition from feudalism to capitalism, French Revolution, rural history and industrialization, and origins of nationalism.

HTS 6103. Social and Political History of the Nonwestern World. 3 Credit Hours.
Covers basic empirical and relevant theoretical literature in English on the social and political history of Africa, Asia, and/or Latin America.

HTS 6106. Business Organizations and Political Economy. 3 Credit Hours.
Examines the historical evolution and contemporary operations of business institutions within the larger context of political economy; emphasis on business, government, and technology.

HTS 6110. Gender, Science, and Technology. 3 Credit Hours.
Examines the ways in which gendered relations shape scientific and technological institutions, careers, artifacts, knowledge, and culture.

HTS 6111. Technology and Modern Culture. 3 Credit Hours.
Introduces the complex interplay between technological systems and diffuse systems of consumption, social organization, and culture beyond the act of production.

HTS 6112. Studies in Science and Engineering. 3 Credit Hours.
Empirical investigation of scientific and engineering practice in historical and contemporary settings.

HTS 6113. Development, Technology and Science. 3 Credit Hours.
Explores the impact of science and technology on development and modernization. Credit not allowed for both HTS 6113 and HTS 4011.

HTS 6114. Topics in the History of Science. 3 Credit Hours.
Explores topics in the history of science in their social and political contexts.

HTS 6115. Sociology of Science and Technology. 3 Credit Hours.
Explores current debates in the history of the sociology of science and technology. Credit not allowed for both HTS 6115 and HTS 3082.

HTS 6116. The Environment in World History. 3 Credit Hours.
Surveys the field of global environmental history with examples taken from biology, geography, sociology and anthropology.

HTS 6117. Urbanization. 3 Credit Hours.
An intensive introduction to the political, social, and economic forces involved in the process of urbanization. Credit not allowed for both HTS 6117 and HTS 6105.

HTS 6118. Science, Technology and the Economy. 3 Credit Hours.
Examines how science and technology are related to economic institutions and processes. Credit not allowed for both HTS 6118 and HTS 6107.

HTS 6119. Race and Ethnicity. 3 Credit Hours.
Examines the structural impact of racism and ethnic discrimination on American society, and the controversies over racial and ethnic identity. Credit not allowed for both HTS 6119 and HTS 6108.

HTS 6120. Inequality, Science and Technology. 3 Credit Hours.
Explores the impacts of science and technology on inequality, as well as how notions of difference have shaped science and technology. Credit not allowed for both HTS 6120 and HTS 6109.

HTS 6121. Science, Technology, and National Security. 3 Credit Hours.
Topics in the study of the relationship between national security and the scientific-technological enterprise from diverse perspectives.

HTS 6122. History of Medicine. 3 Credit Hours.
The impact of disease in history, modern developments in medicine and health focusing on western medicine in a global context.

HTS 6123. Social and Cultural Studies of Biomedicine. 3 Credit Hours.
Introduces students to the changing social, political, and corporate worlds of the biological sciences, biotechnology, and biomedicine.

HTS 6124. Science and Technology Beyond Borders. 3 Credit Hours.
Discusses the roles of science and technology as instruments of social control and of social change in development and modernization. Credit not allowed for both HTS 6124 and HTS 6104.

HTS 6743. Science, Technology & Soceity: Core Seminar. 3 Credit Hours.
This survey course covers key works in Science, Technology & Society, and guest lectures introduce students to faculty doing STS-related research across the Ivan Allen College. Credit not allowed for both HTS 6743 and PUBP 6743 or LCC 6743.

HTS 6801. Research Paper. 3 Credit Hours.
Under the direct supervision of one or more faculty members, graduate students will complete an original research design and execute that study.

HTS 6XXX. History, Technology, & Society Elective. 1-21 Credit Hours.

HTS 7001. Foundations of Socio-historical Analysis. 3 Credit Hours.
Introduces key concepts and methods used in the historical analysis of social phenomena.

HTS 7002. Research and Writing Seminar. 3 Credit Hours.
Introduces methods of sociohistorical research and writing; requires preparation of an original research paper based on primary sources.

HTS 7999. Comprehensive Exam Preparation. 3 Credit Hours.
Preparation for comprehensive exam in fields of history or sociology.

HTS 8001. Comparative History of Labor, Industry, Technology, and Society. 3 Credit Hours.
An intensive, team-taught reading seminar covering major themes and classic works in these fields.

HTS 8801. Special Topics. 1 Credit Hour.

HTS 8802. Special Topics. 2 Credit Hours.

HTS 8803. Special Topics. 3 Credit Hours.

HTS 8804. Special Topics. 4 Credit Hours.

HTS 8805. Special Topics. 5 Credit Hours.

HTS 8806. Special Topics. 6 Credit Hours.

HTS 8901. Special Problems. 1-21 Credit Hours.

HTS 8902. Special Problems. 1-21 Credit Hours.

HTS 8903. Special Problems. 1-21 Credit Hours.

HTS 8904. Special Problems. 1-21 Credit Hours.

HTS 8905. Special Problems. 1-21 Credit Hours.

HTS 8906. Special Problems. 1-21 Credit Hours.

HTS 8997. Teaching Assistantship. 1-9 Credit Hours.
For graduate students holding a teaching assistantship.

HTS 8998. Research Assistantship. 1-9 Credit Hours.
For graduate students holding a research assistantship.

HTS 9000. Doctoral Thesis. 1-21 Credit Hours.

Humanities Elective (HUM)

HUM 1XXX. Humanities Elective. 1-21 Credit Hours.

HUM 21XX. Literature Elective. 1-21 Credit Hours.

HUM 2XXX. Humanities Elective. 1-21 Credit Hours.

HUM 3XXX. Humanities Elective. 1-21 Credit Hours.

HUM 4XXX. Humanities Elective. 1-21 Credit Hours.

Ivan Allen College (IAC)

IAC 2001. Global Religions and Community Engagement. 3 Credit Hours.
This course prepares students for leadership in a multi-faith society through the study of global religions and active engagement with diverse religious communities of Atlanta.

IAC 2002. Science, Engineering, and Religion: An Interfaith Dialogue. 3 Credit Hours.
This course gathers diverse students serious about faith to explore topics at the intersection of science, engineering, and religion.

IAC 2801. Special Topics in IAC. 1 Credit Hour.
Special Topics in IAC.

IAC 2803. Special Topics in IAC. 3 Credit Hours.
Special Topics courses for IAC.

IAC 2813. Special Topics in IAC. 3 Credit Hours.
Special Topics courses in IAC.

IAC 3803. Special Topics in IAC. 3 Credit Hours.
Special Topics courses in IAC.

IAC 3813. Special Topics in IAC. 3 Credit Hours.
Special Topics courses in IAC.

IAC 4803. Special Topics in IAC. 3 Credit Hours.
Special Topics courses in IAC.

IAC 4811. Special Topics in IAC. 1 Credit Hour.
Special Topics in IAC.

IAC 4813. Special Topics in IAC. 3 Credit Hours.
Special Topics courses in IAC.

Industrial Design (ID)

ID 1011. Industrial Design Fundamentals 1. 2 Credit Hours.
Theory and practice in Industrial Design including an introduction to process, methodology, ergonomics, research tools and user research. Focus is on fundamental design principles.

ID 1012. Industrial Design Fundamentals 2. 2 Credit Hours.
Theory and practice in Industrial Design including an introduction to process, methodology, ergonomics, research tools and user research. Focus is on CAD and digital prototyping.

ID 1101. Introduction to Industrial Design 1. 1 Credit Hour.
Introduction to Industrial Design – a survey of evolving diverse career options and the designer's impact on society. Emphasis on traditional product design, research, and strategy.

ID 1102. Introduction to Industrial Design 2. 1 Credit Hour.
Introduction to Industrial Design – a survey of evolving diverse career options and the designer's impact on society. Emphasis is on user experience and interaction design.

ID 1401. Introduction to Graphic Communications 1. 1 Credit Hour.
Introduction to graphic design, composition, layout, color, typography, photography, social media & videography. Emphasis of this first course is on development of basic visual literacies.

ID 1402. Introduction to Graphic Communications 2. 1 Credit Hour.
Introduction to graphic design, composition, layout, color, typography, photography, social media & videography. This second course in the sequence will emphasize digital skill development.

ID 1418. Introduction to Sketching and Modeling 1. 1 Credit Hour.
Introduction to basic visual representation techniques that empower designers of products, services and systems through sketching, model making, computer-assisted drawing, rapid prototyping, and other methods.

ID 1419. Introduction to Sketching and Modeling 2. 1 Credit Hour.
Introduction to intermediate visual representation techniques that empower designers of products, services and systems through sketching, model making, computer-assisted drawing, rapid prototyping, and other methods.

ID 1XXX. Industrial Dsgn Elective. 1-21 Credit Hours.

ID 2011. Introductory Design I. 4 Credit Hours.
Foundation course in visual communications theory and practice, continuing the development of two-dimensional visual literacy. Emphasis on both analog and digital media.

ID 2012. Introductory Design II. 4 Credit Hours.
Foundation course in form giving and representing, continuing the development of three-dimensional visual literacy. Emphasis on visual relationships between form and image.

ID 2021. Industrial Design Studio 1. 4 Credit Hours.
This course provides an introduction to the design process on visual principles and presentation techniques with a focus on sketching and modeling techniques related to 3D form.

ID 2022. Industrial Design Studio 2. 4 Credit Hours.
This course applies more structured design methods to research and exploration of product form and function and introduces concepts of universal design and user centered design.

ID 2023. Industrial Design Studio 1. 3 Credit Hours.
This course applied structured design methods to research and exploration of product form and function and introduces concepts of user centered design.

ID 2024. Industrial Design Studio 2. 3 Credit Hours.
This course applies structured user-centered design methods to research and exploration of product design and function, and introduces concepts of universal design.

ID 2101. Digital Design Methods. 3 Credit Hours.
This course introduces the basics of product design in the CAD environment. Stuents design a product, apply 3D scanning, produce an animation and 3D print.

ID 2102. 3D Modeling. 2 Credit Hours.
This course introduces 3D modeling methods for solid and surface modeling in CAD software. Students create multi-component assembly drawings and explore rendering techniques for product design.

ID 2201. Sustainable Issues for Design. 3 Credit Hours.
Introduction to the broad environmental issues that face humankind as a participant in the biosphere.

ID 2202. History of Modern Industrial Design. 3 Credit Hours.
History and development of industrial design from the beginning of the Industrial Revolution to the present.

ID 2241. History of Art 1. 3 Credit Hours.
This course surveys art from Prehistory through the Renaissance and is organized around stylistic periods that are arranged chronologically. Classes will consist of lectures with slides that focus on these stylistic periods.

ID 2242. History of Art 2. 3 Credit Hours.
This course surveys the major artistic movements and aesthetics of the 17th, 18th, 19th, 20th, and early 21st centuries in painting, sculpture and architecture.

ID 2320. Human Factors in Design. 3 Credit Hours.
This course examines the theory of Human Factors to provide a working knowledge of the physical and cognitive attributes of people that designers must accomodate.

ID 2325. User Centered Design Methods. 3 Credit Hours.
This course introduces students to user-centric design methods used to identify, understand, assess and prioritize the neuroscience factors and perceptions that contribute to more effective product design and human-centered design solutions.

ID 2401. Visual Design Thinking. 3 Credit Hours.
Introduction to techniques to help designers build a vocabulary to support effective visual communication including fundamentals of layout, sketching, rendering, schematics, information graphics & storyboarding.

ID 2510. Introduction to Smart Product Design. 3 Credit Hours.
This course provides an introduction to smart product design including the basics of sensor technologies, electronics and programming required to produce working product concept prototypes.

ID 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

ID 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

ID 2XXX. Industrial Dsgn Elective. 1-21 Credit Hours.

ID 3011. Intermediate Design I. 5 Credit Hours.
The systematic design process as applied to industrial design and packaging problems.

ID 3012. Intermediate Design II. 5 Credit Hours.
Various dimensions of human factors applied to design, including: aging, disability, normal age change, childhood and adult anthropometrics, and human capability.

ID 3031. Health Design Studio 1. 4 Credit Hours.
The application of systematic user-centered design methods and research to projects focused on the design development of new and/or improved health-related products with an emphasis on inclusive design.

ID 3032. Health Design Studio 2. 4 Credit Hours.
The application of systematic user-centered design methods and research to projects focused on the design development of new and/or improved health-related products with an emphasis on products and product systems.

ID 3041. Product Development Studio 1. 4 Credit Hours.
The application of systematic user-centered design methods and research to projects focused on the use of parametric design and CNC capabilities in the design development of products, services & systems.

ID 3042. Product Development Studio 2. 4 Credit Hours.
The application of systematic user-centered design methods to projects focused on the design development of 'real-world' products, services, interfaces & systems in collaboration with external sponsors.

ID 3051. Interactive Product Design Studio 1. 4 Credit Hours.
The application of systematic product design and research methods to projects focused on new applications of sensor-based technologies to the creation of interactions, products and interfaces with an emphasis on the importance of user-centered design.

ID 3052. Interactive Product Design Studio 2. 4 Credit Hours.
The application of systematic user-centered design methods to projects focused on new applications of sensor-based technologies with an emphasis on interactive environments, interfaces, navigation and mobility.

ID 3103. Industrial Design Computing I. 3 Credit Hours.
Introduction to 2-D computer drawing systems.

ID 3104. Industrial Design Computing II. 3 Credit Hours.
Introduction to 3-D modeling systems.

ID 3201. Design & Community: The Social and Environmental Impact of Design. 3 Credit Hours.
Students explore socially and environmentally responsible industrial design practices at home and abroad, and partner with local organizations to develop community-based design projects.

ID 3301. Materials I: Renewables. 3 Credit Hours.
This course examines the characteristics, production technologies, histories, and environmental impacts of nine categories of renewable materials familiar to product and product system design.

ID 3302. Materials and Processes II: Nonrenewables. 3 Credit Hours.
Examination of characteristics, production technologies, histories, and environmental impacts of nonrenewable materials used in product design.

ID 3320. Design Methods: User Centered Design. 3 Credit Hours.
This course introduces students to current user-centric design methods used to identify, understand, assess and prioritize the factors and perceptions that contribute to more effective product design and human-centered design solutions.

ID 3510. Introduction to Interactive Product Design. 3 Credit Hours.
This course provides an introduction to interactive product design including the basics of sensor technologies, electronics and programming required to produce working product concept prototypes.

ID 3520. Tangible Interaction. 3 Credit Hours.
This course addresses the design process related to interactive environments. Projects will emphasize the inclusion of ubiquitous and emerging interactive technologies.

ID 3803. Special Topics. 3 Credit Hours.
Topics of current interest in industrial design.

ID 3811. Special Topics. 1 Credit Hour.

ID 3813. Special Topics. 3 Credit Hours.
Topics of current interest in Industrial Design.

ID 3814. Special Topics. 4 Credit Hours.
Special Topics in Industrial Design (lecture and lab).

ID 3824. Special Topics. 4 Credit Hours.

ID 3901. Special Problems. 1-21 Credit Hours.

ID 3902. Special Problems. 1-21 Credit Hours.

ID 3XXX. Industrial Dsgn Elective. 1-21 Credit Hours.

ID 4011. Advanced Design I. 5 Credit Hours.
Application of the design process to advanced multidisciplinary design problems. Experience in solving real design problems from areas such as consumer products and equipment, transportation and equipment.

ID 4012. Advanced Design II. 5 Credit Hours.
Capstone industrial design project of student's own choosing, with consent of instructor, to refine problem-solving and design ability in preparation for professional practice.

ID 4061. ID Capstone Design Studio 1. 4 Credit Hours.
Comprehensive team-based projects incorporating an iterative approach to design development of products, & systems with emphasis on integration of research, user-centered design, prototyping, usability and testing.

ID 4062. ID Capstone Design Studio 2. 4 Credit Hours.
Comprehensive team-based projects incorporating an iterative approach to design development of products, & systems with emphasis on integration of research, user-centered design, prototyping, usability and testing.

ID 4071. Invention Studio 1. 4 Credit Hours.
An interdisciplinary team-based approach to integrate industrial design and engineering competencies in user-centered design development of products and systems with emphasis on corporate-sponsored projects.

ID 4072. Invention Studio 2. 4 Credit Hours.
Comprehensive projects incorporating an iterative approach to user-centered design development of products, systems & services with emphasis on invention, innovation and entrepreneurship.

ID 4081. ID/ME Collaborative Design Studio 1. 4 Credit Hours.
An interdisciplinary team-based approach to integrate industrial design and engineering competencies in user-centered design development of products and systems with emphasis on corporate-sponsored projects.

ID 4082. ID/ME Collaborative Design Studio 2. 4 Credit Hours.
An interdisciplinary team-based approach to integrate industrial design and engineering competencies in user-centered design development of products and systems with emphasis on humanitarian projects.

ID 4103. Alias Studio I. 3 Credit Hours.
Introduction to modeling, rendering, and animation with Alias Studio software.

ID 4104. Alias Studio II. 3 Credit Hours.
Introduction to product animation using Alias Studio software.

ID 4105. Advanced Modeling Concepts for Creating Complex Forms. 3 Credit Hours.
The Advance Modeling Concepts Course explores concepts, tools and theories used to model and validate complex forms encountered in the product design process.

ID 4106. Parametric Product Modeling. 3 Credit Hours.
This course focuses on advanced digital methods in product modeling for visual analysis, flexible design approaches and digital fabrication methods.

ID 4201. Design/Research Methods. 3 Credit Hours.
Research methods applicable to industrial design including task definition, information gathering, and analysis.

ID 4202. Professional Practice and Preparation. 3 Credit Hours.
Principles of consulting and corporate industrial design including preparation of the professional portfolio.

ID 4203. French Society and Culture. 3 Credit Hours.
Studies in French society and culture.

ID 4204. Theorizing Design. 3 Credit Hours.
Introduction to what designers do and how they undertake their tasks; examples will come from a variety of design disciplines.

ID 4205. French Design and Culture. 3 Credit Hours.
Studies in French design and culture.

ID 4206. Culture of Objects: A Seminar on the Design and Culture of Objects. 3 Credit Hours.
This seminar surveys the theories and methodologies within the field of industrial design that locate meaning in the designed object as derived from culture.

ID 4210. Introduction to Universal Design in the Built Environment. 3 Credit Hours.
This course provides an introduction to universal design focusing on the implications of ability on the usability of places, products, and systems for all individuals.

ID 4320. Prototyping Interaction: Designing for Experience. 3 Credit Hours.
This course exposes students to a range of practical methods for research and design exploration to support the design development of interactive products and technologies.

ID 4418. Design Sketching. 3 Credit Hours.
This course addresses drawing and visualization techniques necessary for design thinking and development and introduces methods and processes to formulate and present visual information.

ID 4450. Developing a Professional Design Portfolio. 3 Credit Hours.
The portfolio development course provides students with a structured approach to preparing a professional visual record of their work in print and digital formats.

ID 4510. Wearable Product Design. 3 Credit Hours.
Wearable Product Design explores techniques in producing designs and prototypes for on-body interactions, and general textile knowledge for making effective wearable products.

ID 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

ID 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

ID 4803. Special Topics: Furniture. 3 Credit Hours.
Special topics in furniture design not covered in the professional curriculum.

ID 4813. Special Topics: Sustainability. 3 Credit Hours.
Special topics in sustainability not included in the professional curriculum.

ID 4823. Special Topics: Information Technology. 3 Credit Hours.
Special topics in information technology not included in the professional curriculum.

ID 4824. Special Topics. 4 Credit Hours.

ID 4833. Special Topics: Collaborative. 3 Credit Hours.
Application of the design process to advanced multidisciplinary problems by a team. Projects from a range of interest areas: consumer, industrial products, transportation, furniture.

ID 4843. Special Topics: History and Theory. 3 Credit Hours.
Special topics in history and theory not included in the professional curriculum.

ID 4900. Special Problems: Visual Communications. 1-21 Credit Hours.
Special problems in communication not covered in the professional curriculum.

ID 4901. Special Problems: Mentor Program. 1-21 Credit Hours.
Special problems in teaching pedagogy; mentoring by senior faculty in basic and intermediate design courses.

ID 4902. Special Problems: Mentor Program. 1-21 Credit Hours.
Special problems in teaching pedagogy; mentoring by senior faculty in basic and intermediate design courses.

ID 4903. Special Problems: Research. 1-21 Credit Hours.
Special research topics for advanced students not covered in the professional curriculum.

ID 4904. Special Problems: Research. 1-21 Credit Hours.
Special research topics for advanced students not covered in the professional curriculum.

ID 4XXX. Industrial Dsgn Elective. 1-21 Credit Hours.

ID 6100. Introduction to Graduate Studies in Industrial Design. 3 Credit Hours.
Introduction to the theory and practice of graduate studies in Industrial Design in relation to human-centered design, assistive technology, interaction, product system design, usability, user experience, interface, and instructional design.

ID 6101. Human Centered Design. 3 Credit Hours.
This course examines design artifacts in relation to the human body, aging, disabilities, and environments with a perspective of human-centered methodology that includes data gathering, analysis, and usability.

ID 6102. Graduate Studio A. 4 Credit Hours.
Studio introduces the MID certificate in Design. The ID studio class stands at the heart of design education and professional practice. Industrial Design is considered from a strategic perspective. Assignments explore the business, technology and use experience components.

ID 6103. Graduate Studio B. 4 Credit Hours.
This course is a project-based ID studio that gives students an overview of and practice with the insights-driven, iterative ID process.

ID 6104. Rapid Design Vis. 2 Credit Hours.
This course trains students in the basics of sketching and free hand drawing needed in the Industrial Design studio environment.

ID 6105. Brand and Visual Design. 3 Credit Hours.
This course introduces the principles of branding and visual identity. It emphasizes branded experiences in a service/product/mobile context.

ID 6106. 3D Design Methods. 2 Credit Hours.
This course teaches students about the 3D digital tools needed to develop products for human form. By learning how to model, render and animate, students can better express their research, ideations and designs.

ID 6107. Integrated Product Design. 3 Credit Hours.
Introduction to smart products teaches students to create IOT products. Students work with sensors and signals, U/I design, and multi-platform prototyping.

ID 6108. Survey of Industrial Design History. 3 Credit Hours.
This course surveys the history of industrial design from the Industrial Revolution to contemporary times.

ID 6109. Human Factors and Ergonomics. 3 Credit Hours.
This course teaches students about the human perspective in design, research, and interactions with physical and interface products. Students learn about tools and techniques used instructional design, human-computer interaction, product design, user-centered design, and usability.

ID 6200. Industrial Design Graduate Studio I. 6 Credit Hours.
Graduate application of the design process to advanced multidisciplinary design problems. Experience in solving real design problems for consumer products.

ID 6201. Industrial Design Graduate Studio II. 6 Credit Hours.
Graduate-level application of the design process to advanced multidisciplinary problems.

ID 6211. Graduate Studio One. 4 Credit Hours.
This course introduces the design program philosophy, human-centered design and evidence-driven research from a strategic perspective. Assignments explore the technology, business, and user experience components in the design process and validate the final design with advanced usability tools and methods.

ID 6212. Grad Studio Two: Health and Wellness. 4 Credit Hours.
This course explores the application of systematic product design methods to projects that focus on the design of new and/or improved health products, interactions, and delivery of services.

ID 6213. Grad Studio Two: Interactive Products. 4 Credit Hours.
This course explores the application of systematic product design methods to projects that focus on the design development of new/or improved interactive or smart products.

ID 6214. Strategic Design Language. 3 Credit Hours.
Introduction to techniques to help designers clarify and support design ideas in a strategic business context by exploring methods to better leverage visual design skills.

ID 6215. Service Design. 3 Credit Hours.
This course introduces best practices of service design and focuses on the alignment and design of multiple brand touch points to optimize customer experience.

ID 6216. Service Design, Brand and Value Creation. 3 Credit Hours.
This course introduces students to how data gathering and analysis, perception, visual, product, interface, and service design align to optimize user experiences that drive business service and value creation.

ID 6271. Healthcare Design of the Future. 3 Credit Hours.
Introduction to research-based approaches to integrated healthcare design innovation.

ID 6400. Master's Project. 1-21 Credit Hours.
Under the guidance of a faculty member, students explore a design project that relates to advance theoritical research through a human prespective with a design and/or technology focus on a product. The project may include areas in instructional design, human-computer interaction, learning, neuroscience, perception, product design, user-centered design, and usability.

ID 6401. Visualizing Interaction. 3 Credit Hours.
Introduction to techniques that empower designers to plan and create effective and clear visual communication depicting the interaction and relationships between people, products, and services.

ID 6403. Intro to Thesis Studies. 3 Credit Hours.
This introduction to thesis course helps students understand the human-centered research methods, analytical tools, and design processes used in developing a thesis or project in graduate studies.

ID 6420. Advanced Sketching. 3 Credit Hours.
This class will focus on developing advanced, traditional (non-digital) sketching, rendering, and presentation techniques.

ID 6506. Parametric Product Modeling. 3 Credit Hours.
This graduate course focuses on advanced digital methods in product modeling for visual analysis, flexible design approaches and digital fabrication methods.

ID 6508. Shape Grammars. 3 Credit Hours.
Shape grammars are a powerful formal system for the generative description, interpretation and evaluation of designs.

ID 6509. Computation, Creativity and Design Cognition. 3 Credit Hours.
This course investigates computational methods, models, tools that support design creativity and cognition. Credit not allowed for both ID 6509 and ARCH 6509.

ID 6510. Design for Interaction: Working with New Technologies. 3 Credit Hours.
This course examines opportunities for designers to leverage visualization and prototyping methods to foster new applications of technology to enhance user experience in everyday life.

ID 6515. Interface Prototyping: Exploring Tools & Theories. 3 Credit Hours.
This course focuses on interface prototypes, how these are used throughout the design process and the varity of ways they can be created with different technologies. Through interface prototypes, students learn how to express their research, receive user feedback, explore user perceptions, and improve their designs.

ID 6520. Crafting Design Methods. 3 Credit Hours.
Traditional craftwork and how we can use material change, scale shifts, methods of manufacture, and algorithmic analysis to incorporate and revitalize these traditions into design.

ID 6620. Soft Goods Design. 3 Credit Hours.
This graduate course focuses on product opportunities highlighting user benefits from soft material integration.

ID 6753. Human-Computer Interaction Professional Preparation and Practice. 1 Credit Hour.
Preparation for a professional career in HCI. Hands-on workshops in resume and portfolio building, interviewing, public speaking, team work. HCI career choices and trajectories.

ID 6763. Design of Interactive Environments. 3 Credit Hours.
Investigate and design ambient, intelligent, interactive interfaces and computational applications in tangible and physical environment to support health, wellness and quality of life. Credit not allowed for both ID 6763 and COA 6763 or CS 6763.

ID 6800. Investigations of Universal Design in the Built Environment. 3 Credit Hours.
This course provides an advanced level to universal design focusing on the implications of ability on the usability of places, products, and systems for all individuals.

ID 6820. Web Design, Usability and Accessibility. 3 Credit Hours.
This course will teach students the fundamentals of web design and usability issues in online environments, with an emphasis on universal design principles and accessibility.

ID 6830. Wearable Tech for Health. 3 Credit Hours.
This course explores the future of wearable technologies for health by adopting various human-centered design methodologies to meet users' needs, abilities, and expectations.

ID 6998. HCI Master's Project. 1-9 Credit Hours.
Final project for students completing a Human-Computer Interaction master's degree in the Digitial Media track. Repeatable for multi-semester projects.

ID 7000. Master's Thesis. 1-21 Credit Hours.
Under the guidance of a faculty member, students explore advance theoretical research through a human perspective in areas instructional design, human-computer interaction, learning, neuroscience, perception, product design, user-centered design, and/or usability.

ID 7655. Designing For Curiosity. 3 Credit Hours.
This course focuses on the development of research-through-design skills particular to their application in interaction design.

ID 8802. Special Topics in ID. 2 Credit Hours.
Special Topics in Industrial Design.

ID 8803. Special Topics. 3 Credit Hours.
Special Topics in Industrial Design.

ID 8804. Special Topics. 4 Credit Hours.
Special Topics in Industrial Design (lecture and supervised lab).

ID 8900. Special Problems. 1-21 Credit Hours.
Special problems in industrial design.

ID 8903. Special Problems in Human-Computer Interaction. 1-3 Credit Hours.
Small-group of individual investigation of advanced topics in human-computer interaction. Guided study and research.

ID 8997. Teaching Assistantship. 1-9 Credit Hours.
For graduate students holding graduate teaching assistantships.

ID 8998. Research Assistantship. 1-9 Credit Hours.
For graduate students holding graduate research assistantships.

International Logistics (IL)

IL 6450. Analytical Methods. 1 Credit Hour.
This course provides an overview of optimization, statistical, and stochastic models and methods with special emphasis on application to logistics.

IL 6451. Demand and Yield Management. 1 Credit Hour.
This course focuses on demand estimation and modeling and revenue management.

IL 6452. Reverse Green Logistics. 1 Credit Hour.
This course addresses issues, driving forces, and analytical approaches to aid in designing operating reverse logistics systems.

IL 6453. Labor Relations. 1 Credit Hour.
This course compares labor practices in Europe, North America, and Asia with special attention on the influences on logistics.

IL 6454. European Trade and Transport. 1 Credit Hour.
This course provides an overview of legal, cultural, political, and infrastructure issues influencing logistics in Europe.

IL 6455. Finance for the Logistics Practitioner. 1 Credit Hour.
This course provides an in-depth understanding of concepts of finance that relate to logistics, such as valuing logistics activities and measuring logistics performance.

IL 6456. Financial Decision Making for Logistics. 1 Credit Hour.
This course provides a thorough understanding of the key elements of building a better logistics business case.

IL 6457. Trade and Transportation in the Americas. 1 Credit Hour.
This course provides an overview of legal, cultural, political, and infrastructure issues influencing logistics practices in the Americas.

IL 6458. Warehousing and Cross-Docking. 1 Credit Hour.
This course surveys the different types of warehouses and their functions, principles of operation, and strategic relationship to the supply chain.

IL 6459. International Trade and Transportation. 1 Credit Hour.
This course discusses how international trade is financed, what instruments are used and how they work, how transactions are settled, and the role of documentation.

IL 6460. International Freight Management. 1 Credit Hour.
This course focuses on international freight management including consolidation, export packaging, customs, tracking, terminal operations, mode selection, and carrier selection.

IL 6461. Asian Trade and Transportation. 1 Credit Hour.
This course provides an overview of legal, cultural, political, and infrastructure issues influencing logistics practices in Asia.

IL 6464. Supply Chain Management II: ERP Systems. 1 Credit Hour.
This course provides a strategic view of Enterprise Resource Planning and its relationship to logistics functions.

IL 6465. Marketing Channels and Partnering. 1 Credit Hour.
This course focuses on logistics and supply chain issues as they impact the global marketing strategies of companies.

IL 6466. Global Supply Chain Design and Measurement. 1 Credit Hour.
This course focuses on concepts and models for designing and measuring a global supply chain, with special focus on the impact of e-commerce.

IL 6467. Transportation. 1 Credit Hour.
This course focuses on logistics planning, execution, and performance measurement in the transportation industry.

IL 6468. Manufacturing. 1 Credit Hour.
This course focuses on logistics issues within the manufacturing facility including inventory, throughput, lead-time batching, and managing variability.

IL 6472. Supply Chain Integration Lab III. 1 Credit Hour.
This course integrates supply chain management techniques in the Americas, Asia, and Europe through case studies.

IL 6475. Cases in International Logistics I. 2 Credit Hours.
In this course, cases are used to integrate strategic, management, and operating issues in international logistics and supply chain design.

IL 6476. Cases in International Logistics II. 2 Credit Hours.
In this course, cases are used t integrate strategic, management, and operating issues in international logistics and supply chain design.

IL 6477. Cases in International Logistics III. 2 Credit Hours.
In this course, cases are used to integrate strategic, management, and operating issues in international logistics and supply chain design.

IL 6478. Cases in International Logistics IV. 2 Credit Hours.
In this course, cases are used to integrate strategic, management, and operating issues in international logistics and supply chain design.

IL 6480. Supply Chain Lab I. 1 Credit Hour.
This course integrates supply chain management techniques in the region through readings, case studies, meetings and site visits. Typically Supply Chain Lab I focuses on the US. Credit not allowed for both IL 6480 and IL 6470.

IL 6481. Supply Chain Lab II. 1 Credit Hour.
This course integrates supply chain management techniques in the region through readings, case studies, meetings and site visits. Typically Supply Chain Lab II focuses on Europe. Credit not allowed for both IL 6481 and IL 6471.

IL 6483. Supply Chain Lab IV. 1 Credit Hour.
This course integrates supply chain management techniques in the region through readings, case studies, meetings and site visits. Typically Supply Chain Lab IV focuses on Asia. Credit not allowed for both IL 6483 and IL 6473.

IL 6484. Supply Chain Lab V. 1 Credit Hour.
This course integrates supply chain management techinques in the region through readings, case studies, meetings, and site visits. Typically Supply Chain Lab V focuses on Mexico and NAFTA. Credit not allowed for both IL 6484 and IL 6474.

IL 8801. Special Topics. 1 Credit Hour.

Intl Executive MBA (IMBA)

IMBA 6000. Strategic Decision Making and Compromise Game. 1 Credit Hour.
A multifirm, competitive management simulation. The objective is to sharpen intra-firm communications skills using the internet as the communications channel and the art of compromise.

IMBA 6010. Cross-cultural Communications for Management. 2 Credit Hours.
Participants learn tools and information to improve communications skills with new approaches and increased understanding while taking into account the effects of cross-cultural differences on communications.

IMBA 6021. Data Analysis for Business. 2 Credit Hours.
Covers common statistical tools for the analysis of corporate data such as descriptive statistics, probability concepts, sampling and estimation, hypothesis testing, and regression analysis.

IMBA 6030. Organizational Behavior and Theory. 3 Credit Hours.
Students learn the basic concepts and principles of organizational behavior and utilize such to analyze and solve organizational decision-making problems.

IMBA 6031. Leadership and Organizational Behavior. 2 Credit Hours.
This course focuses on the challenges in leading teams and organizations in increasingly complex, global, and dynamic business environments.

IMBA 6032. Leadership and Organizational Behavior. 3 Credit Hours.
This course focuses on the challenges in leading teams and organizations in increasingly complex, global, and dynamic business environments.

IMBA 6040. Economic Analysis of Decisions in a Global Economy. 3 Credit Hours.
Participants are provided with a non-traditional approach using an analytical method with a global perspective to the concepts and role of economics in the world environment.

IMBA 6050. Financial and Managerial Accounting. 3 Credit Hours.
Course covers financial reporting and analysis issues facing firms, and managerial accounting information necessary for planning, controlling, and decision making within such firms.

IMBA 6061. Information Systems for Global Organizations. 2 Credit Hours.
Tools and techniques to manage the information technology infrastructure that supports a global organization.

IMBA 6070. Managerial Finance in World Markets. 4 Credit Hours.
A two-part course providing an understanding of finance concepts and how they are used. The course then further integrates international and ethical considerations wherever applicable.

IMBA 6071. Financial Management. 3 Credit Hours.
An introduction to finance. Topics include time value of money, capital budgeting, risk and return, capital structure, dividend policy, and working capital management.

IMBA 6081. Manufacturing and Service Management. 2 Credit Hours.
Covers the basic conceptual and analytical skills that are required in managing operations and confronting operational problems in competitive markets.

IMBA 6090. Managing Marketing. 3 Credit Hours.
Students are provided with an understanding of marketing and consumer behavior concepts and tools with an international environment approach.

IMBA 6101. Product Strategies for Global Markets. 2 Credit Hours.
Developing and marketing new products and services with an emphasis on international markets.

IMBA 6110. Risk Management and Technology Transfer. 2 Credit Hours.
A course based upon a combination of cases, historical data, and theoretical interpretation on the analysis and allocation of risk in international investment and technology transfer.

IMBA 6121. Managing the Global Workforce. 2 Credit Hours.
A survey of global workforce management principles and the skills necessary to function effectively in a supervisory role in a global organization.

IMBA 6132. Strategy. 3 Credit Hours.
Integrate knowledge of the functional areas of a business to understand how firms gain and sustain a competitive advantage in a globally competitive environment.

IMBA 6140. Competing Globally. 2 Credit Hours.
This course utilizes case studies of companies in various industries and in national cultures to highlight organizational and cultural differences between major economies in the global environment.

IMBA 6150. Entrepreneurship and Entrepreneurial Firms. 1 Credit Hour.
Participants explore the increasing importance of small and medium-sized businesses and new ventures in international business.

IMBA 6160. National and International Regulation of Business. 2 Credit Hours.
Deals with learning how to control the legal aspects of international decisions.

IMBA 6170. Quality, Sustainable Technology, Competitiveness. 1 Credit Hour.
Students learn the philosophy and techniques of strategic quality management while focusing on assessment and group decisions centered on sustaining technology and competitiveness.

IMBA 6180. Leadership Skills and Processes. 1 Credit Hour.
Focuses on identifying and developing the attributes of successful leadership.

IMBA 6200. Strategic Business Simulation. 2 Credit Hours.
A unifying course providing a simulated application of the material taught in the core courses of the program.

IMBA 6210. Analysis of Emerging Technology. 2 Credit Hours.
A case-based course dealing with the role and impact of digital technology in large and small organizations, with special emphasis on multinational companies.

IMBA 6220. Applied Entrepreneurship Seminar. 1 Credit Hour.
A case course building an information bank of theory and practice on start-up enterprises. Several entrepreneurs will co-teach the course with a faculty leader.

IMBA 6230. International Business Negotiations. 1 Credit Hour.
A role-play course involving the complex international negotiation simulation dealing with an international business enterprise and its relationship with one or more governments.

IMBA 6250. International Finance. 2 Credit Hours.
Analysis of foreign exchange markets, exchange rate risk management, international portfolio investments, international asset pricing, cross-border M&A, and equilibrium conditions in international markets.

IMBA 6260. Global Supply Chain and Electronic Commerce. 2 Credit Hours.
Examines business, managerial and economic issues in the management of global supply chains and the role of electronic commerce in the supply chain.

IMBA 6300. Analysis of Global Environments I. 2 Credit Hours.
Analysis of a specific region through an international study tour with emphasis on understanding the economy, culture and business environment.

IMBA 6301. Analysis of Global Environments. 2 Credit Hours.
Analysis of a specific region through an international study tour with emphasis on understanding its economy, culture and business environment.

IMBA 6310. Analysis of Global Environments II. 3 Credit Hours.
Analysis of a specific region through an international study tour with emphasis on understanding the economy, culture and business environment.

IMBA 6400. Global Strategy Project I. 1 Credit Hour.
Students work on a real world problem related to global strategy. The focus in this course is on data collection and problem definition.

IMBA 6401. Global Strategy Project I. 2 Credit Hours.
Students work on a real world problem related to global strategy. The focus in this course is on problem definition, data collection and client engagement management.

IMBA 6410. Global Strategy Project II. 1 Credit Hour.
Students work on a real world problem related to global strategy. The focus in this course is on defining a preliminary solution that has desirable characteristics.

IMBA 6411. Global Strategy Project II. 2 Credit Hours.
Students work on a real world problem related to global strategy. The focus in this course is on problem definition, data collection and client engagement management.

IMBA 6420. Global Strategy Project II. 2 Credit Hours.
Students work on a real world problem related to global strategy. The focus in this course is on defining and presenting a comprehensive solution.

IMBA 6430. Business Strategies for Sustainability. 2 Credit Hours.
Cross-functional strategies to address competitive and regulatory demands placed on firms for achieving sustainable business practices.

International Affairs (INTA)

INTA 1002. Effective Study Abroad. 1 Credit Hour.
Introduces essential background information concerning countries, concepts, and what to do in order to gain maximum benefit from participation in school-sponsored study abroad programs.

INTA 1050. The World Today. 3 Credit Hours.
Introduction to current issues of politics, geography, and history around the globe, using a wide variety of media and sources.

INTA 1110. Introduction to International Relations. 3 Credit Hours.
An introduction to the major principles, concepts, actors, and theories of the international system and their application to current issues in world affairs.

INTA 1200. American Government in Comparative Perspective. 3 Credit Hours.
Examines American government in relation to other political and economic systems in countries around the world. Includes study of the Constitution of Georgia. Credit not allowed for both POL 1101 and INTA 1200.

INTA 1XXX. International Affairs Elective. 1-21 Credit Hours.

INTA 2001. Careers in International Affairs. 1 Credit Hour.
Reinforces career development and planning process for international affairs majors. Includes facilitation of decision-making skills, job search strategies, self-assessment, and overview from industry speakers. Credit not allowed for both INTA 2001 and INTA 1001.

INTA 2010. Empirical Methods. 3 Credit Hours.
Develops skills in research design, model building, and hypothesis construction. Provides experience in using computer software programs to perform statistical tests including t-tests, chi-square, and regression.

INTA 2030. Ethics in International Affairs. 3 Credit Hours.
Surveys the main traditions and theories of international ethics with a focus on intervention and the use of force, human rights, self-determination, and global distributive justice.

INTA 2040. Science, Technology, and International Affairs. 3 Credit Hours.
An overview of science and technology as a determinant in the development and functioning of states and societies worldwide and the international context for the development of science and technology.

INTA 2042. Introduction to Global WMD Issues. 3 Credit Hours.
This course will explore the challenges, history, and major theoretical frameworks relating to weapons of mass destruction (WMD).

INTA 2050. Introduction to Global Development. 3 Credit Hours.
Mainstream and critical approaches to development, the role of diverse institutions and projects, and implications for sustainability in the countries of the global south.

INTA 2100. Theoretical Approaches to Great Power Relations. 3 Credit Hours.
Juxtaposes competing explanations for the patterns of conflict and cooperation among nations, illustrated by relations among the great powers of Europe and Asia during the past two centuries.

INTA 2120. Introduction to International Security. 3 Credit Hours.
Introduction to the role of theory and provide an understanding of the significance of various issues in international security.

INTA 2210. Comparative Political Philosophies and Ideologies. 3 Credit Hours.
Explores political ideologies and philosophies, including theories of democracy, capitalism, and socialism, as well as rival views of the "good society" in comparative and historical perspective.

INTA 2220. Government and Politics of Western Europe. 3 Credit Hours.
A comparative analysis of the politics and major institutions of the countries of contemporary Western Europe.

INTA 2221. Politics of the European Union. 3 Credit Hours.
Introduction and overview of the history and politics of the European Union from its inception to the new era of development under the 2009 Lisbon Treaty.

INTA 2230. Government and Politics of Asia. 3 Credit Hours.
An introduction to the major issues and aspects of the politics, societies, and cultures of East Asia, and the changing role of the region in international affairs.

INTA 2241. Government, Politics and Society of Latin America. 3 Credit Hours.
Introduction to the study of historical forces, cultural production, identity, political development and contemporary issues in Latin America.

INTA 2260. Government, Politics and Society of the Middle East. 3 Credit Hours.
Introduction to the study and analysis of contemporary Middle East politics with an emphasis on the Arab states.

INTA 2694. Intern Assistantship. 21 Credit Hours.
Undergraduate Internship for International Affairs for pay.

INTA 2695. Undergraduate Internship. 1-21 Credit Hours.
Undergraduate Internship for International Affairs for academic credit.

INTA 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

INTA 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

INTA 2803. Special Topics. 3 Credit Hours.
Topics of current interest in International Affairs.

INTA 2813. Special Topics. 3 Credit Hours.
Topics of current interest in International Affairs.

INTA 2823. Special Topics. 3 Credit Hours.
Topics of current interest in International Affairs.

INTA 2833. Special Topics. 3 Credit Hours.
Topics of current interest in International Affairs.

INTA 2901. Special Problems. 1-21 Credit Hours.
Independent study with a faculty member.

INTA 2902. Special Problems. 1-21 Credit Hours.
Independent study with a faculty member.

INTA 2903. Special Problems. 1-21 Credit Hours.
Independent study with a faculty member.

INTA 2XXX. International Affairs Elective. 1-21 Credit Hours.

INTA 3010. International Technology Transfer. 3 Credit Hours.
Explores the impact of technology transfer on key contexts such as economic development and the international diffusion of defense production and technology.

INTA 3012. War in the 20th Century. 3 Credit Hours.
Provides historical foundation and understanding of the causes, conduct and consequences of modern war to support informed discussion and analysis of contemporary crisis and conflict.

INTA 3020. Contemporary Mexico. 3 Credit Hours.
This course examines the socio-economic and political history and development of twentieth century Mexico, with a focus on current problems and issues.

INTA 3031. Human Rights in a Technological World. 3 Credit Hours.
Explores how processes of globalization and advances in communication and technology have heightened and shaped human rights as a concern in international politics.

INTA 3040. Energy, Environment, and Policy. 3 Credit Hours.
Explores the interface between energy security and environmental sustainability with the aim of understanding the consequences of policy decisions for ecological, social, and economic systems.

INTA 3042. Energy and International Security. 3 Credit Hours.
Examines issues at the intersection of national energy security and international conflict and cooperation.

INTA 3043. Space Policy. 3 Credit Hours.
Examination of the origins, evolution and range of current challenges and debates in international space policy issues, including civil, military, and commercial activities.

INTA 3044. Global Politics of Technology. 3 Credit Hours.
Examination of the economic and political dynamics that influence how regulations governing technology are adopted around the world.

INTA 3050. The Meaning of Global Citizenship. 3 Credit Hours.
Explore the meaning of global citizenship in scholarly and public debates and how it is "practiced" by individuals and "institutionalized" by universities, corporations and organizations.

INTA 3101. International Institutions. 3 Credit Hours.
Scrutinizes the evolution of international institutions, and juxtaposes competing theoretical approaches for understanding the changing roles and functions of institutions in world affairs.

INTA 3102. The Problem of Proliferation. 3 Credit Hours.
Explores the political and economic issues, both international as well as domestic, involved in the spread of the weapons of mass destruction since the end of the Second World War.

INTA 3103. The Challenge of Terrorism. 3 Credit Hours.
Examines the contexts that nurture domestic and international terrorism, the variety of terrorist organizations, and alternative approaches to combating the problem.

INTA 3104. International Negotiations. 3 Credit Hours.
Examines the theories of bargaining and negotiation, with an emphasis on explaining success and failure in U.S. foreign policy and national security negotiations.

INTA 3110. U.S. Foreign Policy. 3 Credit Hours.
Analyzes the formulation and implementation of America's foreign policy from 1914 to the present, stressing economic, political, and strategic factors.

INTA 3111. U.S. Defense Policy. 3 Credit Hours.
Examines contemporary American defense policy, including the formulation of strategy, the defense budget, force structure, and nontraditional uses of military force.

INTA 3120. European Security Issues. 3 Credit Hours.
Explores the contemporary European security environment, including threats, challenges, and various security architectures (e.g., NATO, the WEU, and the OSCE).

INTA 3121. Foreign Policies of Russia and Eurasia. 3 Credit Hours.
Examines the many dimensions of the foreign and security policies of Russia and the other new post-Soviet states of Russia and Eurasia.

INTA 3130. Foreign Policy of China. 3 Credit Hours.
Analyzes the major dimensions of the foreign policies of the People's Republic of China and the domestic and international influences shaping those policies.

INTA 3131. Pacific Security Issues. 3 Credit Hours.
Examines past, present, and future security concerns in the Pacific, including the Korean peninsula, Japanese defense, the emergence of China as a military power, and the forward basing of American troops and materiel.

INTA 3203. Comparative Politics. 3 Credit Hours.
Contrasts competing theoretical perspectives in the comparative analysis of political systems.

INTA 3220. Government and Politics of Germany. 3 Credit Hours.
Examines the government and politics of Germany with an in-depth focus on the post-1945 period. NOTE: When taught jointly with the School of Modern Languages, all lectures, assignments, and readings are in German.

INTA 3221. Post-Soviet Government and Politics. 3 Credit Hours.
Focuses on the challenge of building new social, political, and economic systems in Russia, but also considers some of the special problems confronting the other fourteen post-Soviet states.

INTA 3223. Transatlantic Relations. 3 Credit Hours.
Analysis of the different aspects of the relationship between the US and the EU and how it is characterized by cooperation, conflict and competition.

INTA 3230. Government and Politics of China. 3 Credit Hours.
Investigates the structure and institutions of political power as well as the patterns and features of political change in the contemporary People's Republic of China.

INTA 3231. Government and Politics of Japan. 3 Credit Hours.
Examines the main institutions, policies, and politics of contemporary Japan. Investigates the impact of social, cultural, and economic forces on Japan's government and politics.

INTA 3232. Sustainable Megaregion. 3 Credit Hours.
Explores the ways in which environmental, economic, social, and technological forces shape megaregion sustainability in through comparison with megaregions in countries around the world.

INTA 3240. Government and Politics of Africa. 3 Credit Hours.
A survey of the history, cultures, social systems, governments, economies, and international roles of Africa. Selected case studies of individual countries are presented.

INTA 3241. Latin American Politics. 3 Credit Hours.
Surveys the government and politics of Latin America. The course begins with an overview of the region's geography and history, and then explains why demographic government has had a tenuous existence in this area.

INTA 3242. Soccer and Global Politics. 3 Credit Hours.
An examination of regional and national identity, development, and politics through the history of soccer.

INTA 3243. US - Latin American Relations. 3 Credit Hours.
Study of government and non-governmental influences on policy and effectiveness of political, economic, and military instruments of power in Latin America.

INTA 3260. Middle East Relations. 3 Credit Hours.
Course will provide an in-depth understanding of the Arab-Israeli conflict using theories of international relations and comparative politics.

INTA 3301. International Political Economy. 3 Credit Hours.
Analyzes the relationship between political and economic issues in international affairs. Examines the interaction of states and markets in the context of trade, investment, and production.

INTA 3303. Political Economy of Development. 3 Credit Hours.
Surveys theories of economic development and political change, and examines a range of cases that include the European-American experience, the East Asian episode, and the transition from socialism.

INTA 3304. International Trade and Production. 3 Credit Hours.
Examines the political economy of international trade and the global production process with particular emphasis on conflict and cooperation in national competition for high- technology industries.

INTA 3321. Political Economy of European Integration. 3 Credit Hours.
Explores the processes and problems of political and economic integration in the European Union, the world's largest trading bloc.

INTA 3330. Political Economy of China. 3 Credit Hours.
Examines the centuries of stagnation and the recent rapid growth of the Chinese economy, and seeks to understand the current interaction between politics and economic development in the People's Republic of China.

INTA 3331. Political Economy of Japan. 3 Credit Hours.
Surveys the political foundations and economic achievements of modern Japan. Explores the interaction of domestic and international forces, and analyzes Japan's changing world role.

INTA 3773. Global Issues and Leadership. 3 Credit Hours.
Invited project based seminar. Uses global issues to explore diverse viewpoints, cultures and cognitive biases to develop leadership and presentation skills in small diverse groups.

INTA 3803. Special Topics. 3 Credit Hours.
Selected topics will vary from term to term.

INTA 3813. Special Topics. 3 Credit Hours.
Selected topics will vary from term to term.

INTA 3823. Special Topics. 3 Credit Hours.
Topics of current interest in International Affairs.

INTA 3833. Special Topics. 3 Credit Hours.
Topics of current interest in International Affairs.

INTA 3XXX. International Affairs Elective. 1-21 Credit Hours.

INTA 4007. Intelligence and International Security. 3 Credit Hours.
This coures examines the history, nature and business of secret intelligence as a critical element of national and international security, with special emphasis given to its role in the global war on terror, and the relationship between the intelligence community and policy makers.

INTA 4011. Technology and Military Organization. 3 Credit Hours.
Addresses the impact of technological developments on the evolution of military organization and on international conflict from the Battle of Agincourt (1415) to the Gulf War (1991).

INTA 4014. Scenario Writing and Pathgaming. 3 Credit Hours.
Introduces students to the construction and presentation of formalized scenarios for international planning, and into the formation, implementation, and assessment of path games. Credit not allowed for both INTA 4014 and INTA 6014.

INTA 4016. Strategy and Arms Control. 3 Credit Hours.
Explores elements of military strategy and tactics, weapons proliferation, and arms control efforts.

INTA 4040. Environmental Politics. 3 Credit Hours.
Examines the interface between politics and the environment. Foci include sustainable development, the politics of the rain forest, eco-tourism, and export agriculture and the environment.

INTA 4050. International Affairs and Technology Policy Making. 3 Credit Hours.
International policy issues in which science and technology figure prominently. Topics include: health, environment, information technologies, arms control and defense, critical infrastructure, transportation, and energy. Emphasis placed on policy analysis and formation.

INTA 4060. International Law. 3 Credit Hours.
Explores major issues, concepts and cases in public international law and their policy ramifications. Specific topics include human rights, armed conflict, crimes against humanity, and the environment.

INTA 4101. Politics of the Vietnam War. 3 Credit Hours.
Strategic approaches and political environments of the United States, North Vietnam, China, and the USSR during 1954-1975 Vietnam War.

INTA 4121. Seminar in Europe: European Security. 3 Credit Hours.
Examines the history, institutional structure, and functions, as well as current policy challenges facing NATO and other European security arrangements.

INTA 4230. Seminar in Europe: European Union. 3 Credit Hours.
Explores the history and processes of economic and political integration within the framework of the European Union.

INTA 4240. Argentine Politics, History, and Culture. 3 Credit Hours.
Survey of the politics, history, and culture of Argentina. Topics include Argentine economic and political failure, the politics of immigration, and the relationship between culture and development.

INTA 4241. Democracy in the Global South. 3 Credit Hours.
Assesses theories about democracy and explores their applicability in the Global South. Examines the concept of democracy and explores its causes and effects.

INTA 4330. Chinese Economic Reform. 3 Credit Hours.
Addresses the profound and consequential process of the Chinese economic reform that started at the end of the 1970s and has led to China's rapid economic growth.

INTA 4331. Chinese Politics in Transition. 3 Credit Hours.
Investigates the organizational apparatus through which the Chinese Communist Party exercises leadership over politics and society, and the way in which reforms have changed those relationships.

INTA 4332. Chinese Institutions and Policy Process. 3 Credit Hours.
Supervised field research on the Chinese institutions and policy-making process especially in the areas of economic and social issues.

INTA 4333. Korean Security Policy. 3 Credit Hours.
An examination of the principal policy issues facing the United States with regard to the Korean Peninsula and the principal neighboring states, China and Japan.

INTA 4340. Latin American Regional Economic and Political Integration. 3 Credit Hours.
Examines institutional, interest group, international, and economic inputs and outputs of regional integration.

INTA 4500. Pro-Seminar in International Affairs. 3 Credit Hours.
Capstone experience in which students formulate strategies and policies to cope with international problems. Themes vary from seminar to seminar. Credit not allowed for both INTA 4500 and INTA 4400.

INTA 4694. Intern Assistantship. 1-21 Credit Hours.
Undergraduate Internship for International Affairs for pay.

INTA 4695. Undergraduate Internship. 1-21 Credit Hours.
Undergraduate Internship for International Affairs for academic credit.

INTA 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

INTA 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

INTA 4740. Seminar in Political Economy. 3 Credit Hours.
Capstone experience in which students apply tools of political economy to international issues. Crosslisted with ECOn 4740.

INTA 4741. Thesis in Political Economy. 3 Credit Hours.
Individual project applying the tools of political economy to international issues. Crosslisted with ECON 4741.

INTA 4742. Modeling, Simulation, and Military Gaming. 3 Credit Hours.
Creation and use of modeling and simulation tools to analyze and train students regarding strategic events in international relations. Credit not allowed for both INTA 4742 and INTA 6742 (or CSE 6742 or CS 4343).

INTA 4743. Japanese Society and Politics. 3 Credit Hours.
Surveys key aspects of Japanese society and politics through the use of Japanese language readings, films, and other instructionsal materials. Course taught mostly in Japanese. Crosslisted with JAPN 4743.

INTA 4744. Global Development Capstone. 3 Credit Hours.
Teams develop solutions to multidisciplinary problems selected from globalization, food security, infrastructure, health, water, sanitation, hygiene, ecosystem resilience, services, capacity building, and urbanization.

INTA 4745. Information and Communication Technologies and Global Development. 3 Credit Hours.
Focus on technology, design, adoption, and use as seen through the lens of global development.

INTA 4803. Special Topics. 3 Credit Hours.
Selected topics will vary from term to term.

INTA 4811. Special Topics. 1 Credit Hour.
Topics of interest not covered in the regular course offerings.

INTA 4812. Special Topics. 2 Credit Hours.
Topics of interest not covered in the regular course offerings.

INTA 4813. Special Topics. 3 Credit Hours.
Topics of interest not covered in the regular course offerings.

INTA 4814. Special Topics. 4 Credit Hours.
Topics of interest not covered in the regular course offerings.

INTA 4815. Special Topics. 5 Credit Hours.
Topics of interest not covered in the regular course offerings.

INTA 4823. Special Topics. 3 Credit Hours.
Selected topics will vary from term to term.

INTA 4833. Special Topics. 3 Credit Hours.
Selected topics will vary from term to term.

INTA 4901. Special Problems. 1-21 Credit Hours.
Independent study with a faculty member.

INTA 4902. Special Problems. 1-21 Credit Hours.
Independent study with a faculty member.

INTA 4903. Special Problems. 1-21 Credit Hours.
Independent study with a faculty member.

INTA 4XXX. International Affairs Elective. 1-21 Credit Hours.

INTA 6002. Strategic Decision Making. 3 Credit Hours.
Examines the dynamics of individual, group, organizational, cross-cultural, and international interaction.

INTA 6003. Empirical Research Methods. 3 Credit Hours.
This course introduces research methods in international affairs. It emphasizes writing research proposals, empirical techniques, gathering and assembling data, and methods for analyzing and reporting results.

INTA 6004. Modeling, Forecasting, and Decision Making. 3 Credit Hours.
This course introduces modeling and forecasting in strategic decision making, analysis of long-term developments, path gaming, formal analysis of games, and simulation.

INTA 6011. International Trade and Technology Transfer. 3 Credit Hours.
This course examines the relationship between international trade and technology transfer and their effect on national competitiveness, national security, and international cooperation and coercion.

INTA 6014. Scenario Writing and Path Gaming. 3 Credit Hours.
Introduces students to the construction and presentation of formalized scenerios for international planning, and into the formulation, implementation and assessment of path games. Credit not allowed for both INTA 6014 and INTA 4014.

INTA 6015. Technology and Military Organizations. 3 Credit Hours.
Explores changes in military technology, organization, and operations leading to new conceptions of the conduct of warfare as a result of revolutions in military affairs.

INTA 6016. Strategy and Arms Control. 3 Credit Hours.
Explores elements of military strategy and tactics, weapons proliferation, and arms control efforts.

INTA 6022. Ethics and International Affairs. 3 Credit Hours.
An overview of the main tradition and theories of international ethics applied to four major issues: intervention and the use of force; human rights; self- determination; and global distributive justice.

INTA 6102. International Relations Theory. 3 Credit Hours.
This course provides an introduction to theoretical approaches to understanding international relations. The focus of the course is on system-level theories and sub-systematic-level theories.

INTA 6103. International Security. 3 Credit Hours.
Examines traditional and nontraditional issues in international security, including the uses of military force, military strategy and policy, arms control, peacekeeping, the environment, and migration.

INTA 6105. International Institutional Design. 3 Credit Hours.
This course examines international institutions and their effect on foreign policy decision makers. Specific topics include: the theoretical study of cooperation; supranatural organizations and informal institutions.

INTA 6106. The State in International Affairs. 3 Credit Hours.
Explores various concepts of the state in international affairs as well as the concepts of sovereignty and revolution.

INTA 6111. U.S. Foreign and National Security Strategy. 3 Credit Hours.
This course focuses on the design and implementation of U.S. foreign policy and national strategy in the areas of arms control, the Third World, and economic policy.

INTA 6121. Seminar In Europe: European Security. 3 Credit Hours.
This course examines the history, institutional structure and functions, and current policy challenges facing the North Atlantic Treaty Organization (NATO) and other European security institutions.

INTA 6122. Science, Technology and National Security. 3 Credit Hours.
Topics in the study of the relationship between national security and the scientific-technological enterprise from diverse perspectives.

INTA 6131. Pacific Security Issues. 3 Credit Hours.
Examines past, present, and future security concerns in the Pacific, including the Korean pennisula, Japanese defense, the emergence of China as a military power, and the forward basing of American troops and material.

INTA 6202. Comparative Politics. 3 Credit Hours.
This course surveys the major political types of the late twentieth century world and explores their various development characteristics.

INTA 6203. Comparative Institutional Design. 3 Credit Hours.
This course examines the creation, maintenance, and evolution of political institutions, and the ways in which institutions affect policy choice.

INTA 6302. International Political Economy. 3 Credit Hours.
This course is an introduction to the politics of international economic relations. Major theoretical approaches are applied to international trade, international monetary relations, and global production in the modern era.

INTA 6306. Globalization. 3 Credit Hours.
Research seminar exploring theoretical perspectives on globalization and the political and economic issues facing modern states and their citizens in a "borderless" world.

INTA 6320. Seminar in Europe: European Union. 3 Credit Hours.
This course explores the history and processes of economic and political integration within the framework of the European Union.

INTA 6330. Political Economy of East Asia. 3 Credit Hours.
This course explores the politics of economic development in China, Japan, and Korea. Focal issues include: trade patterns, financial institutions, trade-bloc formation, industrial competitiveness, and the status of U.S.-East Asian economic relations.

INTA 6331. Chinese Political Economy. 3 Credit Hours.
This course examines the Chinese social and economic development from the seventh century to current day. Specific emphasis is placed on the political economic reforms of Deng Xiaoping and assessing the implications of continued Chinese modernization.

INTA 6450. Data Analytics and Security. 3 Credit Hours.
Explores use of big data techniques to problems at the national and international levels. Topics may include cybersecurity, surveillance, economic development, behavioral prediction and manipulation.

INTA 6704. Introduction to Global Development. 3 Credit Hours.
This course introduces students to the goals, theories and key institutional actors involved in the field of Global Development.

INTA 6720. Seminar: Politics Tech & Proliferation. 3 Credit Hours.
This seminar course is designed specifically to encourage new thinking and creative effort on nuclear deterrence and strategic stability for our global future.

INTA 6740. Innovation, the State and Industrial Development in International Perspective. 3 Credit Hours.
Research seminar exploring the role of the state in industrial development, innovation and business-government relations. Special attention given to science and technology policies and their influence in different international and industrial contexts. Crosslisted with PUBP 6740.

INTA 6742. Modeling, Simulation and Military Gaming. 3 Credit Hours.
Focuses on the creation and use of modeling and simulation tools to analyze and train students regarding strategic events in international relations. Credit not allowed for both INTA 6742 and CSE 6742 (or INTA 4742 or CS 4343).

INTA 6745. Information and Communication Technologies and Global Development. 3 Credit Hours.
Focus on technology design, adoption, and use as seen through the lens of global development.

INTA 6753. Comparative Science and Technology Policy. 3 Credit Hours.
Examination of the social, political, and cultural contexts of science and technology, and how they affect the research, development, and regulatory policies of nations. Crosslisted with PUBP 6753.

INTA 6XXX. Intl Affairs Elective. 1-21 Credit Hours.

INTA 7000. Master's Thesis. 1-21 Credit Hours.
Under the direct supervision of one or more faculty members, graduate students will complete an original research design and execute that study.

INTA 8000. Seminar in Science, Technology and International Affairs I. 3 Credit Hours.
Research course introducing engineers and scientists to issues in science and technology as related to international security policy and development.

INTA 8001. Seminar in Science, Technology and International Affairs II. 3 Credit Hours.
Research course introducing engineers and scientists to issues in science and technology as related to international security policy and development.

INTA 8010. International Affairs, Science and Technology Ph.D. Proseminar. 1 Credit Hour.
An overview of resources and practices of doctoral research in International Affairs, Science, and Technology. Meetings will consist of faculty guest lectures and talks from Library personnel and others.

INTA 8801. Special Topics. 1 Credit Hour.

INTA 8802. Special Topics. 2 Credit Hours.

INTA 8803. Special Topics. 3 Credit Hours.

INTA 8804. Special Topics. 4 Credit Hours.

INTA 8805. Special Topics. 5 Credit Hours.

INTA 8813. Special Topics. 3 Credit Hours.
Topics of interest in the field of international affairs.

INTA 8815. Special Topics. 5 Credit Hours.

INTA 8823. Special Topics. 3 Credit Hours.
Topics of interest in International Affairs.

INTA 8833. Special Topics. 3 Credit Hours.
Topics of interest in the field of International Affairs.

INTA 8901. Special Problems. 1-21 Credit Hours.

INTA 8902. Special Problems. 1-21 Credit Hours.

INTA 8903. Special Problems. 1-21 Credit Hours.

INTA 8997. Teaching Assistantship. 1-9 Credit Hours.
For graduate students with a teaching assistantship.

INTA 8998. Research Assistantship. 1-9 Credit Hours.
For graduate students with a research assistantship.

INTA 9000. Doctoral Thesis. 1-21 Credit Hours.

Internship (INTN)

INTN 2000. Professional Internship. 12 Credit Hours.
Academic related professional work experience.

INTN 2003. P/T Professional Internship. 3 Credit Hours.
Supervised professional work experience in the United States for undergraduate freshman or sophomore interns working 10-19 hours a week in their major field of study for a semester.

INTN 2006. Supervised Work Experience. 6 Credit Hours.
Supervised domestic work experience for freshmen and sophomore interns working 20-29 hours per week in their major field of study for a semester.

INTN 2009. Supervised Work Experience. 9 Credit Hours.
Supervised domestic work experience for freshmen and sophomore interns working 30 to 35 hours per week in their major field of study for a semester.

INTN 3011. International Internship Experience. 12 Credit Hours.
Undergradute interns working outside the United States.

INTN 3013. International Internship. 3 Credit Hours.
Supervised professional international experience for undergraduate interns working abroad full-time in their major field of study for approximately 25% of a semester.

INTN 3016. International Internship Experience. 6 Credit Hours.
Supervised professional international experience for undergraduate interns working abroad full-time in their major field of study for approximately 50% of a semester.

INTN 3019. International Internship Experience. 9 Credit Hours.
Supervised professional international experience for undergraduate interns working abroad full-time in their major field of study for approximately 75% of a semester.

INTN 4000. Professional Internship. 12 Credit Hours.
Academic related professional work experience.

INTN 4003. P/T Professional Internship. 3 Credit Hours.
Supervised professional work experience in the United States for undergraduate junior or senior interns working 10-19 hours a week in their major field of study for a semester.

INTN 4006. Supervised Work Experience. 6 Credit Hours.
Supervised domestic work experience for junior or senior interns working 20-29 hours per week in their major field of study for a semester.

INTN 4009. Supervised Work Experience. 9 Credit Hours.
Supervised domestic work experience for junior or senior interns working 30-35 hours per week in their major field of study for a semester.

INTN 6003. Graduate Internship Program. 3 Credit Hours.
Supervised work experience for Master's and Ph.D. student interns working 6 - 9 hours per week in their field of study; suitable for part-time GRAs and GTAs.

INTN 6004. Graduate Internship Program Part Time. 4 Credit Hours.
Supervised work experience for Master's and Ph.D. student interns working 10 - 15 hours per week in their field of study for a semester.

INTN 6006. Graduate Internship Program Half-Time. 6 Credit Hours.
Supervised work experience for Master's and Ph.D. student interns working 16 - 20 hours per week in their field of study for a semester.

INTN 6009. Graduate Internship Program Less Than Full Time. 9 Credit Hours.
Supervised work experience for Master's and Ph.D. student interns working 21-31 hours per week in their field of study for a semester.

INTN 6012. Graduate Internship Program. 12 Credit Hours.
Supervised work experience for Master's and Ph.D. student interns working 32 - 40 hours per week in their field of study for a semester.

Industrial & Systems Engr (ISYE)

ISYE 1XXX. Industrial & Systems Engineering Elective. 1-21 Credit Hours.

ISYE 2027. Probability with Applications. 3 Credit Hours.
Topics include conditional probability, density and distribution functions from engineering, expectation, conditional expectation, laws of large numbers, central limit theorem, and introduction to Poisson Processes.

ISYE 2028. Basic Statistical Methods. 3 Credit Hours.
Point and interval estimation of systems parameters, statistical decision making about differences in system parameters, analysis and modeling of relationships between variables.

ISYE 2127. Honors Probability. 3 Credit Hours.
Topics parallel those in ISYE 2027 with an intended treatment that is more innovative and challenging. Credit not allowed for both ISYE 2127 and 2027.

ISYE 2128. Honors Statistics. 3 Credit Hours.
Topics parallel to those in ISYE 2028 with an intended treatment that is more innovative and challenging. Credit not given for both ISYE 2028 and 2128.

ISYE 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

ISYE 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

ISYE 2801. Special Topics. 1 Credit Hour.
Courses in special topics of timely interest to the profession, conducted by resident or visiting faculty.

ISYE 2803. Special Topics. 3 Credit Hours.
Courses in special topics of timely interest to the profession, conducted by resident or visiting faculty.

ISYE 2XXX. Industrial & Systems Engineering Elective. 1-21 Credit Hours.

ISYE 3025. Essentials of Engineering Economy. 1 Credit Hour.
Introduction to engineering economic decision making, economic decision criteria, discounted cash flow, replacement and timing decisions, risk, depreciation, and income tax.

ISYE 3030. Basic Statistical Methods. 3 Credit Hours.
Point and interval estimation of systems parameters, statistical decision making about differences in system parameters, analysis and modeling of relationships between variables.

ISYE 3039. Methods of Quality Improvement. 3 Credit Hours.
Topics include quality system requirements, designed experiments, process capability analysis, measurement capability, statistical process control, and acceptance sampling plans. Credit will not be awarded for both ISYE 3039 and ISYE 6382.

ISYE 3044. Simulation Analysis and Design. 3 Credit Hours.
Discrete event simulation methodology emphasizing the statistical basis for simulation modeling and analysis. Overview of computer languages and simulation design applied to various industrial situations.

ISYE 3103. Introduction to Supply Chain Modeling: Logistics. 3 Credit Hours.
Course focuses on engineering design concepts and optimization models for logistics decision making in three modules: supply chain design, planning and execution, and transportation.

ISYE 3104. Introduction to Supply Chain Modeling: Manufacturing and Warehousing. 3 Credit Hours.
Design and operation of manufacturing and warehousing facilities.

ISYE 3106. Cornerstone Design for Industrial Engineers. 3 Credit Hours.
Structure a complex problem through information gathering, data analysis, industrial engineering and design principles application, project management, while working in and leading diverse teams.

ISYE 3133. Engineering Optimization. 3 Credit Hours.
Topics include modeling with networks and graphs; linear, nonlinear, and integer programming, construction of models employing modern modeling languages; and general solution strategies.

ISYE 3232. Stochastic Manufacturing and Service Systems. 3 Credit Hours.
Methods for describing stochastic movements of material in manufacturing facilities, supply chain, and equipment maintenance networks. Includes analysis of congestion, delays, and inventory ordering policies.

ISYE 3770. Statistics and Applications. 3 Credit Hours.
Introduction to probability, probability distributions, point estimation, confidence intervals, hypothesis testing, linear regression, and analysis of variance. Crosslisted with MATH 3770 and CEE 3770. Also, credit not awarded for both ISYE 3770 and MATH 3670.

ISYE 3790. Introduction to Cognitive Science. 3 Credit Hours.
Multidisciplinary perspectives on cognitive science. Interdisciplinary approaches to issues in cognition, including memory, language, problem solving, learning, perception, and action. Crosslisted with CS, PST, and PSYC 3790.

ISYE 3803. Special Topics. 3 Credit Hours.
Courses in special topics of timely interest to the profession conducted by resident or visiting faculty.

ISYE 3833. Special Topics. 3 Credit Hours.
Courses in special topics of timely interest to the profession, conducted by resident or visiting faculty.

ISYE 3XXX. Industrial & Systems Engineering Elective. 1-21 Credit Hours.

ISYE 4009. Design of Human-Integrated Systems. 3 Credit Hours.
Topics include general cognitive systems engineering concepts and principles, and specific concepts and principles of interface design, task analysis, prototyping, and empirical usability of evaluation methods.

ISYE 4031. Regression and Forecasting. 3 Credit Hours.
Regression analysis: multiple linear regression, diagnostics, and variable selection. Forecasting: exponential smoothing techniques and autoregressive moving average models.

ISYE 4034. Decision and Data Analytics. 3 Credit Hours.
This course integrates decision and data analytics to solve real-world business problems. It includes hands-on system modeling, data collection and analysis, and reporting writing projects.

ISYE 4045. Advanced Simulation. 3 Credit Hours.
Advanced modeling and statistical concepts in discrete-event simulations; Monte Carlo simulation; estimation of error and risk; advanced input modeling techniques; comparison and optimization of systems.

ISYE 4106. Senior Design. 4 Credit Hours.
Senior design project requiring student to formulate a project plan with an off-campus enterprise. Includes specific milestones, targets, and evaluation criteria.

ISYE 4111. Advanced Supply Chain Logistics. 3 Credit Hours.
This course is a follow-up to ISyE 3103 that covers optimization models and case studies for logistics network design and logistics operations.

ISYE 4133. Advanced Optimization. 3 Credit Hours.
Theory and implementation of practical methods to find good or optimal solutions to optimization problems too large or complex to solve in a straightforward way.

ISYE 4134. Constraint Programming. 3 Credit Hours.
This course is an introduction to constraint programming, from its modeling language to its computational methodology and its applications to scheduling, routing, and resource allocation.

ISYE 4232. Advanced Stochastic Systems. 3 Credit Hours.
The course will cover Jackson Networks and Markov Decision Processes with applications to production/inventory systems, customer contact centers, revenue management, and health care.

ISYE 4301. Supply Chain Economics. 3 Credit Hours.
The course studies techniques for coordination and collaboration in supply chains. Applications include pricing strategies, revenue management, gaming, and incentives.

ISYE 4311. Capital Investment Analysis. 3 Credit Hours.
Students learn core concepts and techniques for economic decision and analysis of complex capital investment problems that involve dimensions of time, uncertainty and strategy.

ISYE 4331. Honors Optimization. 3 Credit Hours.
Topics parallel those in ISYE 4231 with an intended treatment that is more innovative and challenging. Credit not given for both ISYE 4331 and 4231.

ISYE 4501. Energy, Efficiency, and Sustainability. 3 Credit Hours.
Analysis and modeling of energy production and use, material and energy efficiency, sustainability, and cost for systems, products, and services.

ISYE 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

ISYE 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

ISYE 4740. Bio-Inspired Design. 3 Credit Hours.
We examine evolutionary adaptation as a course for engineering design inspiration, utilizing principles of scaling, adaptability, and robust multifunctionality that characterize biological systems. Credit not allowed for both ISYE 4740 and (BIOL 4740, or PTFE 4740 or MSE 4740 or ME 4740).

ISYE 4800. Special Topics. 0 Credit Hours.
ISYE Senior Design Preparation.

ISYE 4801. Special Topics. 1 Credit Hour.
Courses in special topics of timely interest to the profession, conducted by resident or visiting faculty.

ISYE 4802. Special Topics. 2 Credit Hours.
Courses in special topics of timely interest to the profession, conducted by resident or visiting faculty.

ISYE 4803. Special Topics. 3 Credit Hours.
Courses in special topics of timely interest to the profession, conducted by resident or visiting faculty.

ISYE 4813. Special Topics. 3 Credit Hours.
Courses in special topics of timely interest to the profession conducted by resident or visiting faculty.

ISYE 4823. Special Topics. 3 Credit Hours.
Courses in special topics of timely interest to the profession, conducted by resident or visiting faculty.

ISYE 4833. Honors Topics. 3 Credit Hours.
Topics of current interest in the field of ISYE that are covered with an appropriately high level of innovation and rigor.

ISYE 4843. Special Topics. 3 Credit Hours.
Topics of current interest in the field of ISYE.

ISYE 4852. Special Topics. 2 Credit Hours.
Courses in special topics of timely interest to the profession, conducted by resident or visiting faculty.

ISYE 4991. Special Problems. 1-21 Credit Hours.
A variable hour credit opportunity to develop initiative and apply fundamental principles by performing semioriginal laboratory or research work in ISYE.

ISYE 4992. Special Problems. 1-21 Credit Hours.
A variable credit hour opportunity to develop initiative and apply fundamental principles by performing semioriginal laboratory or research work in ISYE.

ISYE 4993. Special Problems. 1-21 Credit Hours.
A variable credit hour opportunity to develop initiative and apply fundamental principles by performing semioriginal laboratory or research work in ISYE.

ISYE 4XXX. Industrial & Systems Engineering Elective. 1-21 Credit Hours.

ISYE 6101. Organizational Behavior for Engineers. 3 Credit Hours.
Studies the scientific generation, formalization, and application of the knowledge of individual and group behaviors that engineers need to function effectively within contexts.

ISYE 6201. Manufacturing Systems. 3 Credit Hours.
Topics include analysis of flows, bottlenecks and queuing, types of operations, manufacturing inventories, aggregreate production planning, lot sizes and lead times, and pull production systems.

ISYE 6202. Warehousing Systems. 3 Credit Hours.
Topics include design and analysis of materials handling systems, warehouse layout, order picking strategies, warehousing inventories, warehouse management systems, integration of production and distribution systems. Credit will not be awarded for both ISYE 6202 and ISYE 6383.

ISYE 6203. Transportation and Supply Chain Systems. 3 Credit Hours.
Topics include supply chain characterization, site location, mode selection, distribution planning, vehicle routing, demand management, replenishment management, geographic information systems, and real-time control issues. Credit will not be awarded for both ISYE 6203 and ISYE 6383.

ISYE 6205. Cognitive Engineering. 3 Credit Hours.
Application of cognitive science concepts to system design, and the development of concepts appropriate for understanding and aiding cognition in naturally or technologically complex environments.

ISYE 6215. Models in Human-Machine Systems. 3 Credit Hours.
The development and use of mathematical models of human behavior are considered. Approaches from estimation theory, control theory, queuing theory, and fuzzy set theory are considered.

ISYE 6223. Understanding and Supporting Human Decision Making. 3 Credit Hours.
Prescriptive and descriptive theories of human decision making are discussed/contrasted. Approaches to aiding human decision making are considered in context of these theoretical frameworks.

ISYE 6224. Topics in Human-Integrated Systems. 3 Credit Hours.
State-of-the-art research directions including supervisory control models of human command control tasks; human-computer interface in scheduling and supervision of flexible manufacturing systems.

ISYE 6225. Advanced Engineering Economy. 3 Credit Hours.
Advanced engineering economy topics, including economic worth, economic optimization under constraints, risk and uncertainty, foundations of utility theory.

ISYE 6227. Introduction to Financial Engineering. 3 Credit Hours.
Advanced techniques for economic analysis of capital investment. Basic terminology and financial engineering concepts for managing and valuing project risk. Real options applications in systems engineering.

ISYE 6229. Productivity Measurement and Analysis. 3 Credit Hours.
Modern measurement of productivity measurement and analysis including principles, issues, and latest techniques associated with benchmarking, efficiency measurement, and productivity tracking. Empirical studies and group projects.

ISYE 6230. Economic Decision Analysis. 3 Credit Hours.
Topics include preferences and utilities, social choice, equilibrium concepts, noncooperative and cooperative game theory, price mechanisms, auction mechanisms, voting theory, and incentive compatibility.

ISYE 6231. Design of Human-integrated Systems. 3 Credit Hours.
Analysis and design of complex work domains in technological environments. Credit not allowed for both ISYE 6231 and AE 6721.

ISYE 6232. Safety-critical Real-time Systems. 3 Credit Hours.
Study of system safety, human error, and software reliability.

ISYE 6234. Measurement and Evaluation of Human-integrated Systems. 3 Credit Hours.
Measurements of complex systems including workload, operator strategy, and performance.

ISYE 6307. Scheduling Theory. 3 Credit Hours.
Includes topics in sequencing and scheduling with emphasis on deterministic machine scheduling problems with some stochastic results examined. Complexity of various problems will be analyzed.

ISYE 6320. Public Impact Applications of Operations Research and Management Science. 3 Credit Hours.
The focus is on the health and public applications of Operations Research. Students will complete a group project with a non-profit organization and discuss papers.

ISYE 6331. Statistics for Supply Chain Engineering. 3 Credit Hours.
Collection, management, and analysis of supply chain data.

ISYE 6332. Finance for Supply Chain Engineering. 3 Credit Hours.
Investment and analysis of operating capital.

ISYE 6333. Operations Research for Supply Chain Engineering I. 3 Credit Hours.
Deterministic models of supply chains including location and material flow. Optimization techniques including linear programming, network flows, integer programming, and heuristics.

ISYE 6334. Operations Research fo Supply Chain Engineering II. 3 Credit Hours.
Probabilistic models of supply chains, including the effects of variability; models of wholesale and retail demand; forecasting and simulation.

ISYE 6335. Supply Chain Engineering I. 3 Credit Hours.
Production scheduling; inventory systems; warehousing, including stocking strategies, order-picking, sortation, automation; distribution.

ISYE 6336. Supply Chain Engineering II. 3 Credit Hours.
Transportation: truck-load and less-than-truckload, and package-courier systems; container shipping, including port operations, steamship scheduling; railroad operations, including intermodal; air cargo. The international freight network and patterns of freight flow. Management and recirculation of trailers/containers. Labor issues.

ISYE 6337. Supply Chain Engineering III. 3 Credit Hours.
Problems of coordination and collaboration along the supply chain; make-or-buy decisions; pricing and auctions; wholesale and retail channels; supply chain dynamics, including the bullwhip effect. Distinctive supply chain issues in key economies.

ISYE 6338. Suppply Chain Strategy. 3 Credit Hours.
Case studies of notable supply chains successes and failures.

ISYE 6339. Supply Chain Information Systems. 3 Credit Hours.
Planning and executing systems for inventory, warehousing, transportation, import/export, etc. Services-oriented architecture, cloud computing; systems integration; RFID and other technologies for scanning and monitoring.

ISYE 6340. Supply Chain Engineering Seminar. 3 Credit Hours.
Through a program of industry speakers and facility tours, student will learn to assess and critique supply chain practice.

ISYE 6341. Capstone Project for Supply Chain Engineering I. 3 Credit Hours.
Small groups of students undertake an industry-sponsored project under faculty guidance.

ISYE 6342. Capstone Project for Supply Chain Engineering II. 3 Credit Hours.
Small groups of students undertake an industry-sponsored project under faculty guidance.

ISYE 6380. Production Planning and Control. 3 Credit Hours.
Fundamentals of Production Planning and Lean Manufacturing.

ISYE 6381. Manufacturing Reliability. 3 Credit Hours.
Fundamentals of Reliability and Maintainability Engineering.

ISYE 6382. Quality Control and Six Sigma. 3 Credit Hours.
Fundamentals of Quality Control and Six Sigma Methods. Credit will not be awarded for both ISYE 6382 and ISYE 3039.

ISYE 6383. Fundamentals of Manufacturing Supply Chain Operations. 3 Credit Hours.
Fundamentals of Manufacturing Supply Chain Operations. Credit will not be awarded for both ISYE 6383 and ISYE 6202 or ISYE 6383 and ISYE 6203.

ISYE 6401. Statistical Modeling and Design of Experiments. 3 Credit Hours.
Fundamental coverage of topics in multiple regression and factorial experiments.

ISYE 6402. Time Series Analysis. 3 Credit Hours.
Basic forecasting methods, ARIMA models, transfer functions.

ISYE 6404. Nonparametric Data Analysis. 3 Credit Hours.
Nonparametric statistics and basic categorical data analysis.

ISYE 6405. Statistical Methods for Manufacturing Design and Improvement. 3 Credit Hours.
Fractional factorial designs, response surface methods.

ISYE 6411. Fundamentals of Statistics with Applications. 3 Credit Hours.
Relationships of statistical estimation and linear models with regression, planning and analysis of experiments, and the analysis of correlated data. More mathematical than ISYE 6401.

ISYE 6412. Theoretical Statistics. 3 Credit Hours.
Rigorous introduction to theory of statistical inference. Estimation and testing. Construction and assessment of estimators and tests. Fundamentals of decision theory, minimax, and Bayes Paradigms.

ISYE 6413. Design and Analysis of Experiments. 3 Credit Hours.
Analysis of variance, full and fractional factoral designs at two and three levels, orthogonal arrays, response surface methodology, robust parameter design for production/process improvement.

ISYE 6414. Statistical Modeling and Regression Analysis. 3 Credit Hours.
Simple and multiple linear regression, inferences and diagnostics, stepwise regression and model selection, advanced regression methods, basic design and analysis of experiments, factorial analysis.

ISYE 6416. Computational Statistics. 3 Credit Hours.
This class describes the available knowledge regarding statistical computing. Topics include random deviates generation, importance sampling, Monte Carlo Markov chain (MCMC), EM algorithms, bootstrapping, model selection criteria, (e.g. C-p, AIC, etc.) splines, wavelets, and Fourier transform.

ISYE 6420. Introduction to Theory and Practice of Bayesian Statistics. 3 Credit Hours.
Rigorous introduction to the theory of Beysian Statistical Inference. Bayesian estimation and testing. Conjugate priors. Noninformative priors. Bayesian computation. Bayesian networks and Bayesian signal processing. Various engineering applications.

ISYE 6421. Biostatistics. 3 Credit Hours.
An introduction to fundamental ideas and techniques in Biostatistics, with an emphasis on conceptual understanding and on the analysis of real data sets.

ISYE 6501. Introduction to Analytics Modeling. 3 Credit Hours.
An introduction to important and commonly-used models in analytics, as well as aspects of the modeling process.

ISYE 6644. Simulation. 3 Credit Hours.
Covers modeling of discrete-event dynamic systems and introduces methods for using these models to solve engineering design and analysis problems.

ISYE 6645. Monte Carlo Methods. 3 Credit Hours.
Covers state-of-the-art Monte Carlo simulation techniques. These techniques will be used to model and solve a variety of real-world problems from several diverse areas in science and engineering, including supply chain analysis and design, pattern recognition, VLSI design, network reliability, financial engineering, and molecular biology.

ISYE 6650. Probabilistic Models and Their Applications. 3 Credit Hours.
An introduction to basic stochastic processes such as Poisson and Markov processes and their applications in areas such as inventory, reliability, and queueing.

ISYE 6656. Queuing Theory. 3 Credit Hours.
Processing networks with queuing. Performance analysis using Markov process description of system behavior. Applications and numerical studies in manufacturing, system maintainability, computer systems, telecommunication networks.

ISYE 6661. Linear Optimization. 3 Credit Hours.
Theory, algorithms, and applications of linear programming. Topics include the simplex method and resolution of degeneracy, duality and sensitivity analysis, basis factorization, the dual and revised simplex methods, and geometry of polyhedra. Intended for Ph.D. students.

ISYE 6662. Discrete Optimization. 3 Credit Hours.
Fundamentals of integer and combinatorial optimization. Topics include polyhedra, cuts, Lagrangean duality, complexity, and others. This course is intended for Ph.D. students.

ISYE 6663. Nonlinear Optimization. 3 Credit Hours.
Fundamentals of nonlinear optimization. Topics include optimality conditions; convex programming and duality; unconstrained and constrained methods. Polynomial algorithms and interior point methods. Dual methods. This course is for students seriously considering a PhD.

ISYE 6664. Stochastic Optimization. 3 Credit Hours.
An introduction to sequential decision making under uncertainty. Much of the course is devoted to the theoretical, modeling, and computational aspects of Markov decision processes.

ISYE 6669. Deterministic Optimization. 3 Credit Hours.
An introduction to deterministic optimization methodologies including approaches from linear, discrete, and nonlinear optimization including algorithms and computations. Applications will be introduced as appropriate.

ISYE 6673. Financial Optimization Models. 3 Credit Hours.
An introduction to optimization techniques with special emphasis on applications to finance, including portfolio optimization, immunization, and risk management.

ISYE 6679. Computational Methods in Optimization. 3 Credit Hours.
Strategies and techniques for converting optimization theory into effective computational procedures. Emphasis is on applications in linear, integer, and nonlinear programming; networks and graphs.

ISYE 6701. Energy Technology and Policy. 3 Credit Hours.
Examines energy production, use, and production, use, and policy using quantitative engineering and policy analysis. Addresses resource constraints, physical principles, and policy analysis methods.

ISYE 6739. Basic Statistical Methods. 3 Credit Hours.
Overview of basic tools used in statistical analysis and modeling. Credit not allowed to students seeking a degree in ISYE.

ISYE 6740. Computational Data Analysis: Learning, Mining, and Computation. 3 Credit Hours.
Theoretical/computational foundations of analyzing large/complex modern datasets, including the fundamental concepts of machine learning and data mining needed for both resesarch and practice. Crosslisted with CSE 6740. Credit not awarded for both ISYE 6740 and CS 4641/7641/CSE 6740.

ISYE 6748. Applied Analytics Practicum. 6 Credit Hours.
Practical analytics project experience applying ideas from the classroom to a significant project of interest to a business, government agency, or other organization.

ISYE 6759. Stochastic Processes in Finance. 3 Credit Hours.
Mathematical modeling of financial markets, derivative securities pricing, and portfolio optimization. Concepts from probability and mathematics are introduced as needed. Crosslisted with MATH 6759.

ISYE 6761. Stochastic Processes I. 3 Credit Hours.
Discrete time Markov chains, Poisson and renewal processes; transient and limiting behavior; average cost and utility measures of systems. Intended for Ph.D students. Crosslisted with MATH 6761.

ISYE 6762. Stochastic Processes II. 3 Credit Hours.
Continuous time Markov chains; uniformization, transient and limiting behavior; Brownian motion and martingales; optional sampling and convergence. Intended for Ph.D. students. Crosslisted with MATH 6762.

ISYE 6767. Design and Implementation of Systems to Support. 3 Credit Hours.
Introduction to large-scale system design to support computational finance for options, stocks, or other financial instruments. Some programming experience and previous exposure to stocks, bonds, and options required. Crosslisted with MATH 6767.

ISYE 6769. Fixed Income Securities. 3 Credit Hours.
Description, institutional features, and mathematical modeling of fixed income securities. Use of both deterministic and stochastic models. Crosslisted with MATH 6769.

ISYE 6772. Managing Resources of the Technological Firm. 3 Credit Hours.
This course explores the competitive advantage manufacturing and service firms derive from the effective management of their technology, workforce, materials, and information resources. Crosslisted with MGT 6772.

ISYE 6773. Strategic Management of Technology-based Ventures. 3 Credit Hours.
This course provides a forum for the in-depth examination of issues involving the strategic management of high-tech corporate start-ups and small technology-based businesses. Crosslisted with MGT 6773.

ISYE 6774. Management of Technology Project. 3 Credit Hours.
This course organizes students into multidisciplinary teams devoted to solving a real problem for a technology-based firm. Crosslisted with MGT 6774.

ISYE 6775. Management of Technology Seminar. 1 Credit Hour.
This course introduces the frontiers of key technologies, provides a forum for visiting speakers from the corporate world, and supplements topics from other MOT courses. Crosslisted with MGT 6775.

ISYE 6777. Analysis of Emerging Technologies. 3 Credit Hours.
Methods for technology monitoring, forecasting, and assessment. Crosslisted with PUBP 6777.

ISYE 6779. Dynamic System Simulation and Modeling. 3 Credit Hours.
Models of dynamic systems, such as aircraft,ground vehicles, and machinery, and manual control. Numerical simulation techniques and applications. Interactive simulators. Student programming project. Crosslisted with AE 6779.

ISYE 6781. Reliability Theory. 3 Credit Hours.
Structural properties and reliability of coherent systems.

ISYE 6783. Statistical Techniques of Financial Data Analysis. 3 Credit Hours.
Fundamentals of statistical inference for models used in the modern analysis of financial data. Crosslisted with MATH 6783.

ISYE 6785. The Practice of Quantitative and Computational Finance. 3 Credit Hours.
Case studies, visiting lecturers from financial institutions, student group projects of an advanced nature, and student reports, all centered around quantitative and computational finance. Crosslisted with MATH and MGT 6785.

ISYE 6792. Computer Integrated Manufacturing Systems Seminar. 1 Credit Hour.
Guest speakers on a broad range of manufacturing-related topics: research, applications, and technology. Required for Certificate in Manufacturing. Crosslisted with ECE and ME 6792.

ISYE 6793. Advanced Topics in Quantitative and Computational Finance. 3 Credit Hours.
Advanced foundational material and analysis techniques in quantitative and computational finance. Crosslisted with MATH 6793.

ISYE 6795. Introduction to Cognitive Science. 3 Credit Hours.
Multidisciplinary perspectives on cognitive science. Interdisciplinary approaches to issues in cognition, including memory, language, problem solving, learning, perception, and action. Crosslisted with CS and PSYC 6795.

ISYE 6805. Reliability Engineering. 3 Credit Hours.
Topics include hazard functions, life distributions, censoring, life tables, nonparametric and parametric estimation and inference, accelerated life testing, structure functions, reliability and maintenance systems, replacement theory.

ISYE 6810. Systems Monitoring and Prognostics. 3 Credit Hours.
The course focuses on sensor-based condition monitoring techniques, modeling of degradation processes, fault diagnostics and prognostics of failures in engineering systems using stochastic and statistical methods.

ISYE 6831. Advanced Simulation. 3 Credit Hours.
Topics include generalized semi-Markov processes; input and output analysis; random number, variate, and sample path generation, rare event simulation; and optimization via simulation.

ISYE 6832. Simulation Theory and Methods. 3 Credit Hours.
Theory, algorithms, and applications of computer simulation. Topics include generalized semi-Markov processes; input-output analysis; random number, variate, and sample path generation; variance reduction techniques; and optimization via simulation. This course is intended for Ph.D. students.

ISYE 6XXX. Industrial & Systems Engineering Elective. 1-21 Credit Hours.

ISYE 7000. Master's Thesis. 1-21 Credit Hours.
Required of degree candidates in the master's thesis option.

ISYE 7201. Production and Service Systems Engineering. 3 Credit Hours.
Advanced models in operations planning, scheduling and control of supply chain, production and service systems. Intended for Ph.D. students.

ISYE 7203. Logistics Systems Engineering. 3 Credit Hours.
Advanced modeling and analysis of freight transportation and logistics systems. Intended for Ph.D. students.

ISYE 7204. Informatics in Production & Service Systems. 3 Credit Hours.
A course covers integration of statistics, signal processing and control for variability reduction (modeling, analysis, diagnosis, control) for complex systems in a data rich environment.

ISYE 7205. Inventory Theory. 3 Credit Hours.
Introduces students to the general quantitative models and fundamental theoretical tools underlying some of the novel inventory management strategies of cutting-edge companies.

ISYE 7210. Real-time Interactive Simulation. 3 Credit Hours.
Principles and laboratory experience in design and implementation of interactive simulations of complex dynamic systems.

ISYE 7400. Advanced Design of Experiments. 3 Credit Hours.
Random and mixed models, nested and blocked designs. Intended for Ph.D. students and those seeking the M.S. in Statistics.

ISYE 7401. Advanced Statistical Modeling. 3 Credit Hours.
Nonlinear models, logistic regression, loglinear models. Intended for Ph.D. students and those seeking the M.S. in Statistics.

ISYE 7405. Multivariate Data Analysis. 3 Credit Hours.
Multivariate ANOVA, principal components, factor analysis etc. Intended for Ph.D. students and those seeking the M.S. in Statistics.

ISYE 7406. Data Mining and Statistical Learning. 3 Credit Hours.
Topics include neural networks, support vector machines, classification trees, boosting and discriminant analyses. Intended for Ph.D. students and those seeking the M.S. in Statistics.

ISYE 7441. Linear Statistical Models I. 3 Credit Hours.
Intended for Ph.D. students and those seeking the M.S. in Statistics.

ISYE 7510. Graph Algorithms. 3 Credit Hours.
Algorithms for graph problems such as maximum flow, covering, matching, coloring, planarity, minimum cuts, shortest paths, and connectivity. Crosslisted with MATH 7510 and CS 7510.

ISYE 7653. Case Studies in Logistics/Manufacturing. 3 Credit Hours.
Advanced topics in logistics and manufacturing through the use of industrial case studies. Difficult modeling issues such as data representation and consistency will be introduced.

ISYE 7661. Theory of Linear Inequalities. 3 Credit Hours.
Theoretical foundations of linear and integer programming. Topics include representation of polyhedra, polarity, simplex and ellipsoid algorithms, diophantine equations, Hilbert bases, total dual integrality, and others.

ISYE 7682. Convexity. 3 Credit Hours.
Convex sets, theory of finite systems of linear inequalities, convex functions, convex programming.

ISYE 7683. Advanced Nonlinear Programming. 3 Credit Hours.
Convex programming; linear, conic quadratic and semidefinite programming; cheap optimization methods for extremely large-scale convex problems.

ISYE 7686. Advanced Combinatorial Optimization. 3 Credit Hours.
Typical coverage includes: Matching theory, network optimization, traversals in graphs, integrality of polyhedra, matroids, covers, cliques, and stable sets.

ISYE 7687. Advanced Integer Programming. 3 Credit Hours.
General integer modeling concepts; valid inequalities and facets; duality; general algorithms such as branch-and-bound and branch-and-cut; special purpose algorithms; applications.

ISYE 7688. Computational Mathematical Programming. 3 Credit Hours.
Study of solution techniques in mathematical optimization, emphasizing computational aspects of both theory and algorithms.

ISYE 7750. Mathematical Foundations of Machine Learning. 3 Credit Hours.
Provides the mathematical background for two of the pillars of modern data science: linear algebra and applied probability.

ISYE 7751. Probabilistic Graphical Models in Machine Learning. 3 Credit Hours.
The course provides an introduction to theory and practice of graphical models in machine learning. It covers three main aspects; representation, probabilistic inference, and learning.

ISYE 7790. Cognitive Modeling. 4 Credit Hours.
A hands-on course covering a range of cognitive methodologies. It explores the analysis, development, construction, and evaluation of models of cognitive processing. Crosslisted with CS and PSYC 7790.

ISYE 8011. Seminar. 1 Credit Hour.
Audit basis only.

ISYE 8012. Seminar. 1 Credit Hour.
Audit basis only.

ISYE 8013. Seminar. 1 Credit Hour.
Audit basis only.

ISYE 8014. Contemporary Topics in System Informatics and Control. 1 Credit Hour.
A seminar course to introduce important research problems and applications related to the system informatics and control in production and service systems.

ISYE 8795. Colloquium in Cognitive Sciences. 1 Credit Hour.
Reading of research papers by leading cognitive scientists, attendance at their colloquia, and meeting with them to discuss research. Crosslisted with CS and PSYC 8795.

ISYE 8802. Special Topics in ISYE. 2 Credit Hours.
Special Topics in Industrial and Systems Engineering.

ISYE 8803. Special Topics. 3 Credit Hours.
Special topics in Industrial and Systems Engineering.

ISYE 8811. Special Topics. 1 Credit Hour.
Special topics in Industrial and Systems Engineering.

ISYE 8813. Special Topics in Operations Research. 3 Credit Hours.
Special Topics in the field of Operations Research.

ISYE 8843. Advanced Topics in Statistics. 3 Credit Hours.
For Ph.D. students.

ISYE 8851. Topics in Manufacturing. 3 Credit Hours.
Current topics in manufacturing including: manufacturing automation and controls, advanced planning systems, heuristic scheduling techniques, stochastic models of manufacturing systems, advanced warehousing, and materials handling.

ISYE 8852. Topics in Logistics. 3 Credit Hours.
Current topics in logistics including: inventory control in supply chain design, stochastic vehicle routing, computational methods in logistics systems, location theory, and geographic information systems.

ISYE 8861. Advanced Topics in Stochastics. 3 Credit Hours.
Coverage of advanced topics of interest that support research interests of students in the field.

ISYE 8862. Advanced Topics in Simulation. 3 Credit Hours.
Coverage of advanced topics of interest that support research interests of students in the field.

ISYE 8871. Advanced Topics in Linear and Discrete Optimization. 3 Credit Hours.
Topics may vary with each offering and include subjects such as integer programming, combinatorics, graphs and networks, matching, matroids, polyhedral combinatroics, as well as others.

ISYE 8872. Advanced Topics in Nonlinear Optimization. 3 Credit Hours.
Similar to ISYE 8871 but deals with subjects in nonlinear programming, interior-point methods, convexity, global optimization, etc. Topics may vary each term.

ISYE 8893. Special Topics in Cognitive Science. 3 Credit Hours.

ISYE 8900. Special Problems in Industrial Engineering. 1-21 Credit Hours.

ISYE 8901. Special Problems in Operations Research. 1-21 Credit Hours.

ISYE 8997. Teaching Assistantship. 1-6 Credit Hours.
For graduate students holding graduate teaching assistantships.

ISYE 8998. Research Assistantship. 1-6 Credit Hours.
For graduate students holding graduate research assistantships.

ISYE 9000. Doctoral Thesis. 1-21 Credit Hours.

Japanese (JAPN)

JAPN 1001. Elementary Japanese I. 4 Credit Hours.
Essential principles of Japanese grammar and phonetics, acquisition of vocabulary through conversational exercises, video, and tape material. Introduction to the kana writing system. Humanities credit is awarded for JAPN 1001 upon successful completion of JAPN 1002 or JAPN 2001.

JAPN 1002. Elementary Japanese II. 4 Credit Hours.
Continuation of JAPN 1001. Introduction to kanji symbols.

JAPN 10X1. Trans Elementary Japanese I. 3 Credit Hours.

JAPN 10X2. Trans Elementary Japanese II. 3 Credit Hours.

JAPN 1813. Special Topics. 3 Credit Hours.
Permits a group of students to pursue areas of the Japanese language and culture not extensively treated in other courses.

JAPN 1814. Special Topics. 4 Credit Hours.
Topics of current interest in Japanese.

JAPN 1815. Special Topics. 5 Credit Hours.

JAPN 1816. Special Topics. 6 Credit Hours.
Permits a group of students to pursue areas of the Japanese language and culture not extensively treated in other courses.

JAPN 1XXX. Japanese Elective. 1-21 Credit Hours.

JAPN 2001. Intermediate Japanese I. 3 Credit Hours.
Further principles of Japanese grammar and vocabulary. Introduction to different styles and levels of speech. More kanji.

JAPN 2002. Intermediate Japanese II. 3 Credit Hours.
Continuation of JAPN 2001.

JAPN 2694. Internship Assistantship. 1-21 Credit Hours.
Modern Language Undergraduate Internship for pay for freshmen and sophomores, by permit only. The internship experience must be at a unit or agency approved by the School of Modern Language.

JAPN 2695. Undergraduate Internship. 1-21 Credit Hours.
Modern Language Undergraduate Internship for credit for freshmen and sophomores, by permit only. The internship experience must be at a unit or agency approved by the School of Modern Languages.

JAPN 2698. Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

JAPN 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

JAPN 2813. Special Topics. 3 Credit Hours.
Topics of current interest in Japanese.

JAPN 2XXX. Japanese Elective. 1-21 Credit Hours.

JAPN 3001. Advanced Japanese I. 3 Credit Hours.
Learn advanced grammar structures and develop the ability to produce longer conversations involving complex styles and levels of speech. More kanji.

JAPN 3401. Popular Culture in Japan. 3 Credit Hours.
This course introduces students to Japanese society, history, and language through popular culture. Repeatable for credit if taken with different course theme. Taught in English.

JAPN 3500. Intermediate Japanese Reading and Writing. 3 Credit Hours.
This course enhances students' literacy through reading and writing exercises while cultivating insights into current Japanese socio-cultural issues. Taught in Japanese.

JAPN 3691. Technical and Scientific Japanese. 3 Credit Hours.
Reading of intermediate/advanced technical and scientific Japanese texts. Analysis and discussion of scientific issues in society. Part of the Japanese intensive summer language program. Admission by application only.

JAPN 3692. Business Japanese. 3 Credit Hours.
Acquisition of business terminology, protocols, decorum strategies, and improvement of oral communication skills. Reading and writing of notes, correspondence, and reports. Part of the Japanese intensive summer language program. Admission by application only.

JAPN 3693. Japan Today. 3 Credit Hours.
Development of awareness toward cultural differences and potential communication problems through exploration of current socio-economic and corporate-cultural issues in Japan. Part of the Japanese intensive summer language program. Admission by application only.

JAPN 3694. Conversation Practicum. 3 Credit Hours.
Students practice conversations with native Japanese speakers to expand the repertoire of active vocabulary and grammar patterns and improve their conversational skills. Taught in Japanese.

JAPN 3700. Japanese Readings on Sustainability Issues and Societal Changes. 3 Credit Hours.
Through extensive and intensive readings on sustainability and social changes in Japan, students will analyze and evaluate those topics in Japanese. Taught in Japanese.

JAPN 3811. Special Topics. 1 Credit Hour.
Topics of current interest in Japanese.

JAPN 3812. Special Topics. 2 Credit Hours.

JAPN 3813. Special Topics. 3 Credit Hours.
Topics of current interest in Japanese.

JAPN 3823. Special Topics. 3 Credit Hours.
Topics of current interest in Japanese.

JAPN 3833. Special Topics. 3 Credit Hours.
Topics of current interest in Japanese.

JAPN 3XXX. Japanese Elective. 1-21 Credit Hours.

JAPN 4113. Advanced reading and Listening in Japanese. 3 Credit Hours.
This course introduces advanced grammar and stylistic and idiomatic expressions in Japanese in both written and spoken contexts on a wide range of topics.

JAPN 4123. Technical and Business Japanese Translation. 3 Credit Hours.
This is an applied language course that provides practical experience in translating technical and business documents to and from Japanese.

JAPN 4163. Introduction to Japanese Literature and Culture. 3 Credit Hours.
This is an introductory course in Japanese literature and culture where students read and interpret authentic literary texts and learn and discuss key cultural concepts. Conducted in Japanese.

JAPN 4165. Critical Readings in Japanese Culture and Arts. 3 Credit Hours.
This course helps improve reading skills of advanced learners by analyzing various written texts on topics of culture and society. Taught in Japanese.

JAPN 4173. Japanese Culture and Society through Anime. 3 Credit Hours.
Students will be able to appreciate anime's significance in historical, societal and cultural contexts, as well as the aesthetic quality of its form. Taught in Japanese.

JAPN 4183. Japanese Culture and Society through Songs. 3 Credit Hours.
Students will be exposed to songs in different historical, societal and cultural contexts of Japan, and appreciate their aesthetic quality. Taught in Japanese.

JAPN 4193. Japanese Culture & Society through Documentaries. 3 Credit Hours.
The course explores Japanese culture, language, society, and history through documentary films. Taught in Japanese.

JAPN 4231. Designing Websites in Japanese. 3 Credit Hours.
This course provides instruction in text input in Japanese and explores language and intercultural communication issues when designing Web pages in Japanese. Taught in Japanese.

JAPN 4233. CALI Pedagogy for Japanese. 3 Credit Hours.
This course explores pedagogical issues in designing Computer-Assisted Language Instruction (CALI) programs for teaching Japanese. Taught in Japanese.

JAPN 4235. 3D RPG Development for Japanese Instruction. 3 Credit Hours.
This course explores pedagogical issues in designing Japanese instructional materials based on the 3D, RPG platform of Second Life. Taught primarily in Japanese. Prerequisites: JAPN 3002 (JAPN 4231 and JAPN 4233 are highly recommended).

JAPN 4500. Advanced Intercultural Seminar. 3 Credit Hours.
Integrates cross-cultural research and reflection into discussion of current issues in Japan. Intended for students who have had some study-abroad experience in Japan. Conducted mostly in Japanese.

JAPN 4543. Advanced Japanese for NLP Development. 3 Credit Hours.
This course will explore advanced linguistic, semantic and pragmatic issues unique to Japanese required for developing an NLP system of text-based Japanese.

JAPN 4694. Internship Assistantship. 1-21 Credit Hours.
Modern Language Undergraduate Internship for pay for junior and seniors, by permit only. The internship experience must be at a unit or agency approved by the School of Modern Languages.

JAPN 4695. Japanese Internship. 1-3 Credit Hours.
Professional experience with a business/organization in which students enhance their language skills and cultural knowledge in Japanese in relation to the practical goals/objectives of the entity.

JAPN 4698. Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

JAPN 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

JAPN 4743. Japanese Society and Politics. 3 Credit Hours.
Surveys key aspects of Japanese society and politics through the use of Japanese language readings, films, and other instructional materials. Course taught mostly in Japanese. Crosslisted with INTA 4743.

JAPN 4750. Japanese Discourse and Grammar. 3 Credit Hours.
This course is about Japanese spoken and written discourse, designed for acquiring skills for managing interpersonal relationships through advanced discourse.

JAPN 4780. Japanese Applied Linguistics. 3 Credit Hours.
This course helps develop analytical skills to better understand human languages, particularly English and Japanese. Credit not allowed for both JAPN 4780 and LING 4780.

JAPN 4813. Special Topics. 3 Credit Hours.
Topics of interest not covered in the regular course offerings.

JAPN 4823. Special Topics. 3 Credit Hours.
Topics of current interest in Japanese.

JAPN 4833. Special Topics. 3 Credit Hours.
Topics of current interest in Japanese.

JAPN 4901. Special Problems. 1-21 Credit Hours.
Provides the special instruction required under special programs.

JAPN 4902. Special Problems. 1-21 Credit Hours.
Special problems course for advanced students. Topics to be arranged with instructor.

JAPN 4XXX. Japanese Elective. 1-21 Credit Hours.

JAPN 6080. Japanese Applied Linguistics for Graduate Students. 3 Credit Hours.
This course examines current linguistic theories as applied to Japanese in order to acquire analytical skills to better understand human languages, particularly Japanese and English.

JAPN 6173. Culture and Society through Anime. 3 Credit Hours.
Students will be able to appreciate anime's significance in historical, societal and cultural contexts, as well as the aesthetic quality of its form. Taught in Japanese.

JAPN 6183. Songs: Culture & Society. 3 Credit Hours.
Students will be able to appreciate anime's significance in historical, societal and cultural contexts, as well as the aesthetic quality of its form. Taught in Japanese.

JAPN 6193. Japanese Culture & Society through Documentaries. 3 Credit Hours.
The course explores Japanese culture, language, society, and history through documentary films. Taught in Japanese.

JAPN 6231. Japanese Website Design. 3 Credit Hours.
Students will learn how social media is reshaping BSC communication in Japan and explore intercultural communication issues in designing Websites. Taught in Japanese.

JAPN 6252. Japanese Domestic Internship. 1-3 Credit Hours.
Students complete domestic internships. Conducted in Japanese. Online course. 3 credits.

JAPN 6500. Intercultural Seminar. 3 Credit Hours.
Integrates cross-cultural research and reflection into discussion of current issues in Japan. For students who have had some study/work-abroad experience in Japan. Conducted in Japanese.

JAPN 6503. Professional Portfolio Development. 3 Credit Hours.
Preparation of a professional portfolio connecting experiences and coursework in the MS program towards career preparation. Conducted in Japanese.

JAPN 6510. Applied Language Practicum. 3 Credit Hours.
Students will serve as researchers, student aides and apprentice instructors for any 3/4000-level undergraduate course approved by their adviser and the course.

JAPN 6511. Applied Language Practicum Abroad. 3 Credit Hours.
Students serve as researchers and apprentice instructors in the LBAT or other faculty-led overseas language immersion program of the School of Modern Languages.

JAPN 6695. Japanese Internship Abroad. 1-3 Credit Hours.
Students complete internships abroad in Japan. Conducted in Japanese. Online course. 3 credits.

JAPN 6696. Japanese Internship Abroad. 1-6 Credit Hours.
Japanese Internship Abroad.

JAPN 6998. Master's Project. 1-6 Credit Hours.
Optional project course taught in Japanese.

JAPN 7000. Master's Thesis. 1-6 Credit Hours.
Optional thesis course.

JAPN 8803. Special Topics. 3 Credit Hours.
Topics of current interest not covered in the regular course offerings.

JAPN 8804. Special Topics. 4 Credit Hours.
Special Topics in Japanese.

JAPN 8901. Special Problems in Japanese. 1-21 Credit Hours.
Provides the special instruction required under special programs.

JAPN 8902. Special Problems in Japanese. 1-21 Credit Hours.
Provides the special instruction required under special programs.

JAPN 8903. Special Problems in Japanese. 1-21 Credit Hours.
Provides the special instruction required under special programs.

Korean (KOR)

KOR 1001. Elementary Korean I. 4 Credit Hours.
Students will be able to speak, comprehend, read and write basic Korean sentences, and they will learn fundamentals in inter-personal relationships in Korean culture. Humanities credit awarded upon successful completion of KOR 1002 or KOR 2001.

KOR 1002. Elementary Korean II. 4 Credit Hours.
A continuation of Korean 1001.

KOR 10X1. Trans Elementary Korean I. 3 Credit Hours.

KOR 10X2. Trans Elementary Korean II. 3 Credit Hours.

KOR 1813. Special Topics. 3 Credit Hours.
Topics of current interest in Korean.

KOR 1814. Special Topics. 4 Credit Hours.
Topics of current interest in Korean.

KOR 1XXX. Korean Elective. 1-21 Credit Hours.

KOR 2001. Intermediate Korean I. 3 Credit Hours.
This course continues the introduction to modern colloquial Korean.

KOR 2002. Intermediate Korean II. 3 Credit Hours.
A continuation of Korean 2001.

KOR 2691. Intensive Intermediate Korean I. 3 Credit Hours.
This course teaches students an intermediate level Korean intensively during the summer LBAT study-abroad period in an immersed environment in Korea.

KOR 2692. Intensive Intermediate Korean II. 3 Credit Hours.
This course teaches students an intermediate level Korean intensively during the summer LBAT study-abroad period in an immersed environment in Korea.

KOR 2694. Internship Assistantship. 1-21 Credit Hours.
Modern Language Undergraduate Internship for pay for freshmen and sophomores, by permit only. The internship experience must be at a unit or agency approved by the School of Modern Language.

KOR 2695. Undergraduate Internship. 1-21 Credit Hours.
Modern Language Undergraduate Internship for credit for freshmen and sophomores, by permit only. The internship experience must be at a unit or agency approved by the School of Modern Languages.

KOR 2698. Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

KOR 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

KOR 2813. Special Topics. 3 Credit Hours.
Topics of current interest in Korean.

KOR 2823. Special Topics. 3 Credit Hours.
Topics of current interest in Korean.

KOR 2XXX. Korean Elective. 1-21 Credit Hours.

KOR 3001. Advanced Korean I. 3 Credit Hours.
Development of richer perspectives about Korean culture and enhanced skills in reading, writing, and vocabulary. Conducted in Korean.

KOR 3002. Advanced Korean II. 3 Credit Hours.
Further development of richer perspectives about Korean culture and enhanced skills in reading, writing, and vocabulary. Conducted in Korean.

KOR 3100. Korean Conversation and Culture. 3 Credit Hours.
The course will focus on developing students' conversation skills and grammatical knowledge required for 3000-level courses or higher. Taught in Korean.

KOR 3410. Korean Culture: Old and New. 3 Credit Hours.
Comparison and contrast of aspects of the past and present. Topics include politics, music, the family, popular culture, war and many others. Taught in English.

KOR 3415. Korea in Media: K-Pop, Film, and Drama. 3 Credit Hours.
This course addresses key features of Korean society from the 1960s to the present day through K-Pop, film, and drama. Taught in English.

KOR 3691. Business Korean. 3 Credit Hours.
This course aims to improve oral/written communication skills in business situations in Korea. Taught in Korean; part of Korean intensive summer language program.

KOR 3692. Current Issues and Technology in Korea. 3 Credit Hours.
This course introduces key terms and discusses advances in technology and science in Korea today. Taught in Korean; part of Korean intensive summer language program.

KOR 3693. Exploring Modern Korea. 3 Credit Hours.
This course equips students to understand contemporary Korea through reading and discussion about contemporary topics. Taught in Korean; part of Korean intensive summer language program.

KOR 3811. Special Topics. 1 Credit Hour.
Topics of current interest in Korean.

KOR 3812. Special Topics. 2 Credit Hours.
Topics of current interest in Korean.

KOR 3813. Special Topics. 3 Credit Hours.
Topics of current interest in Korean.

KOR 3823. Special Topics. 3 Credit Hours.
Topics of current interest in Korean.

KOR 3833. Special Topics. 3 Credit Hours.
Topics of current interest in Korean.

KOR 3843. Special Topics. 3 Credit Hours.
Topics of current interest in the Korean languages.

KOR 3XXX. Korean Elective. 1-21 Credit Hours.

KOR 4001. Contemporary Korean. 3 Credit Hours.
This course aims to further the students' knowledge by exposing them to accurate and contemporary expressions in text and multimedia materials. Taught in Korean.

KOR 4002. Selected Readings Of Modern Korean. 3 Credit Hours.
This course aims to enhance students' Korean skills through advanced reading and comprehension, translation, grammar, and writing practice. Taught in Korean.

KOR 4060. Media and Public Culture. 3 Credit Hours.
This is a debating course designed for students who have completed advanced Korean or have demonstrated an equivalent proficiency level. Taught in Korean.

KOR 4150. Korean Service-Learning in the Korean Community. 3 Credit Hours.
This class combines classroom discussion with community service projects to allow students to study Korean cultures and practice Korean with native speakers. Conducted in Korean.

KOR 4500. Intercultural Seminar. 3 Credit Hours.
Enhancement of students' skills and understanding of intercultural communication, skills, and behaviors for globalized business, research, and politics related to South Korea. Taught in Korean.

KOR 4691. Korean Society. 3 Credit Hours.
This course aims to develop students' understanding of Korean society and culture through lectures, discussion, cultural site visits, and field work activities. Taught in Korean.

KOR 4692. Korean Industry. 3 Credit Hours.
This intensive course is designed to enhance students' intercultural understanding of Korean industry and cultural influence. Taught in Korean.

KOR 4694. Internship Assistantship. 1-21 Credit Hours.
Modern Language Undergraduate Internship for pay for junior and seniors, by permit only. The internship experience must be at a unit or agency approved by the School of Modern Languages.

KOR 4695. Korean Internship. 1-3 Credit Hours.
Professional experience with a business/organization in which students enhance their language skills and cultural knowledge in German in relation to the practical goals/objectives of the entity.

KOR 4698. Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

KOR 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

KOR 4813. Special Topics. 3 Credit Hours.
Topics of current interest in Korean.

KOR 4823. Special Topics. 3 Credit Hours.
Topics of current interest in Korean.

KOR 4833. Special Topics. 3 Credit Hours.
Topics of current interest in Korean.

KOR 4901. Special Problems. 1-21 Credit Hours.
Special problems course for advanced students. Topics to be arranged with instructor.

KOR 4902. Special Problems. 1-21 Credit Hours.
Special problems for advanced students. Topics to be arranged with instructor.

KOR 4XXX. Korean Elective. 1-21 Credit Hours.

KOR 6001. Contemporary Korean. 3 Credit Hours.
This course aims to further the students' knowledge by exposing them to contemporary expressions in text and multimedia materials in Korean. Taught in Korean.

KOR 6060. Media and Public Culture Korean. 3 Credit Hours.
The course focuses on analysis of Korean media. Offered in Korean.

KOR 6252. DOM Internship Korean. 1-3 Credit Hours.
Student completes domestic internship. Conducted in Korean. Online course.

KOR 6500. Intercultural Seminar Korean. 3 Credit Hours.
This course aims to develop student's cultural fluency, communication skills and competences required in a globalized context of business, research, and politics. Taught in Korean.

KOR 6510. Language Practicum Korean. 3 Credit Hours.
Students will serve as researchers, student aides and apprentice instructors for a 3000- or 4000-level undergraduate course approved by their adviser.

KOR 6511. Language Practicum Abroad Korean. 3 Credit Hours.
Students will serve as researchers, student aides and apprentice instructors for a 3000- or 4000-level undergraduate course approved by their adviser and the course.

KOR 6695. Internship Abroad Korean A. 1-3 Credit Hours.
Student completes internships in Korea.

KOR 6696. Internship Abroad Korean B. 1-6 Credit Hours.
Student completes internships in Korea.

KOR 6998. Master's Project. 1-6 Credit Hours.
Optional project course.

KOR 7000. Master's Thesis. 1-6 Credit Hours.
Optional thesis course.

KOR 8803. Special Topics. 3 Credit Hours.
Special Topics in Korean Language and Literature.

KOR 8804. Special Topics. 4 Credit Hours.
Special Topics in Korean.

KOR 8901. Special Problems in Korean. 1-21 Credit Hours.
Provides the special instruction required under special programs.

KOR 8902. Special Problems in Korean. 1-21 Credit Hours.
Provides the special instruction required under special programs.

KOR 8903. Special Programs in Korean. 1-21 Credit Hours.
Provides the special instruction required under special programs.

Latin (LATN)

LATN 2XXX. Latin Elective. 1-21 Credit Hours.

Linguistics (LING)

LING 1813. Special Topics. 3 Credit Hours.
Topics of current interest in Linguistics.

LING 1XXX. Linguistics Elective. 1-21 Credit Hours.

LING 2100. Introduction to Linguistics. 3 Credit Hours.
Introductory course that surveys various fields in linguistics, including first/second language acquisition, phonetics/phonology, morphology/syntax, semantics/pragmatics, language variation, computational linguistics/natural language processing, and writing systems. Credit not allowed for both LING 2100 and LING 2001.

LING 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

LING 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

LING 2813. Special Topics. 3 Credit Hours.
Topics of current interest in Linguistics.

LING 2XXX. Linguistics Elective. 1-21 Credit Hours.

LING 3100. Applications of Linguistics. 3 Credit Hours.
Explores the relation of language (and linguistic theories) to real-world domains including language acquisition, education, gender, advertising, politics, law, and medicine. Taught in English.

LING 3811. Special Topics. 1 Credit Hour.
Topics of current interest in Linguistics.

LING 3812. Special Topics. 2 Credit Hours.
Topics of current interest in Linguistics.

LING 3813. Special Topics. 3 Credit Hours.
Permits students to work in languages not treated in other courses and/or engage in special language research.

LING 3823. Special Topics. 3 Credit Hours.
Topics of current interest in Linguistics.

LING 3833. Special Topics. 3 Credit Hours.
Topics of current interest in Linguistics.

LING 3XXX. Linguistics Elective. 1-21 Credit Hours.

LING 4015. Advanced Language Processing. 3 Credit Hours.
This flexible course explores computational-, psycho-, or corpus linguistics (depending on instructor expertise). Students read/present academic articles, process data using Python/R/Qualtrics, and pursue original projects.

LING 4100. Language & Computers. 3 Credit Hours.
A linguistic perspective on language processing topics (search, vector semantics, document classification, digital humanities, translation, dialog). Students read current literature and implement concepts in Python.

LING 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

LING 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

LING 4780. Japanese Applied Linguistics. 3 Credit Hours.
This course helps to develop analytical skills to better understand human languages, particularly English and Japanese. Taught in English. Credit not allowed for both LING 4780 and JAPN 4780.

LING 4813. Special Topics. 3 Credit Hours.
Topics of interest not covered in the regular course offerings.

LING 4823. Special Topics. 3 Credit Hours.
Topics of current interest in Linguistics.

LING 4833. Special Topics. 3 Credit Hours.
Topics of current interest in Linguistics.

LING 4901. Special Problems in Linguistics. 1-21 Credit Hours.
Special problems course for advanced students; topics to be arranged with instructor.

LING 4902. Special Problems in Linguistics. 1-21 Credit Hours.
Special problems for advanced students; topics to be arranged with instructor.

LING 4XXX. Linguistics Elective. 1-21 Credit Hours.

LING 6015. Advance Topics in Language Processing. 3 Credit Hours.
This flexible course explores computational-, psycho-, or corpus linguistics (depending on instructor expertise). Students read/present academic articles, process data using Python/R/Qualtrics, and pursue original projects.

LING 8803. Special Topics. 3 Credit Hours.
Special Topics in Linguistics language and literature,

LING 8901. Special Problems in Linguistics. 1-21 Credit Hours.
Provides the special instruction required under special programs.

LING 8902. Special Problems in Linguistics. 1-21 Credit Hours.
Provides the special instruction required under special programs.

LING 8903. Special Programs in Linguistics. 1-21 Credit Hours.
Provides the special instruction required under special programs.

Literature, Media & Comm (LMC)

LMC 1XXX. Literature, Media, & Communication Elective. 1-21 Credit Hours.

LMC 2000. Introduction to Literature, Media, and Communication. 3 Credit Hours.
An the introductory course to LMC, this course introduces students to key texts and modes of analysis associated with the study of literature, film, digital media, and communication.

LMC 2050. Seminar in Literature, Media, and Communication. 3 Credit Hours.
This course introduces second-semester majors to the intellectual movements, interpretive frameworks, and research skills central to the disciplines represented in LMC.

LMC 2060. Introduction to Literary Studies. 3 Credit Hours.
Students will study literary and cultural texts, methods, and critical movements from a variety of perspectives and historical periods.

LMC 2100. Introduction to Science, Technology and Culture. 3 Credit Hours.
Relation to other courses, programs and curricula: As the introductory course to the LMC Science, Technology and Culture thread, this course explores the way in which disciplines construct and represent the knowledge they generate.

LMC 2200. Introduction to Gender Studies. 3 Credit Hours.
This course introduces the cultural concept of gender, examining topics such as biology and gender, social constructions of gender, and the psychology of sexual roles.

LMC 2350. Introduction to Social Justice. 3 Credit Hours.
Introduces students to the work and theory of social justice through readings from various disciplines, including literature, history, anthropology, philosophy, science, policy, and law.

LMC 2400. Introduction to Media Studies. 3 Credit Hours.
This course offers an introduction to the historical development and cultural impact of various forms of media print, radio, television, film, and interactive electronic applications.

LMC 2410. Introduction to Game Studies. 3 Credit Hours.
Introduction to the games studies and game designs.

LMC 2450. Introduction to Black Media Studies. 3 Credit Hours.
Introduces scholarship in Black Media Studies (BMS), which studies the relationships among media, culture, and racial politics by and about people of African descent.

LMC 2500. Introduction to Film. 3 Credit Hours.
Introduces film techniques and vocabulary in an historical and cultural context. Written texts are supplemented by viewings of specific shots, scenes, and films.

LMC 2500R. LMC 2500 Recitation. 0 Credit Hours.
Film Screening for Introduction to Film.

LMC 2600. Introduction to Performance Studies. 3 Credit Hours.
An examination of the origins of the field of performance studies in literary study of theatre and drama, anthropological investigations of ritual, and sociological analyses of performance in everyday life.

LMC 2661. Theatre Production I. 1 Credit Hour.
In this hands-on course, students learn theatrical construction and painting techniques while building scenery for DramaTech productions.

LMC 2662. Theatre Production II. 1 Credit Hour.
In this hands-on course, students create the lighting, property, and costume effects for two DramaTech Theatre productions.

LMC 2698. Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

LMC 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

LMC 2700. Introduction to Computational Media. 3 Credit Hours.
Introduction to key concepts, methods, and achievements in computational media, and the convergence of digital technology with cultural traditions of representation.

LMC 2720. Principles of Visual Design. 3 Credit Hours.
Studio-based course that provides students with basic skills needed to create digital visual images and to analyze designs from historical and theoretical perspectives.

LMC 2730. Constructing the Moving Image. 3 Credit Hours.
Provides the student with the conceptual, formal, aesthetic, and technical approaches to reconsider film, videos, and animation within the context of emerging digital forms.

LMC 2823. Special Topics in Literature and Culture. 3 Credit Hours.
Examination of one or more topics of current interest in literary and cultural studies.

LMC 2XXX. Literature, Media, & Communication Elective. 1-21 Credit Hours.

LMC 3062. Film Acting Workshop. 3 Credit Hours.
A workshop-based introduction to screen acting and the acting profession for the student who is interested in participating in the film and television industries.

LMC 3102. Science, Technology, and the Classical Tradition. 3 Credit Hours.
Explores the definition and transmission of science and technology within Greek, Arabic, and medieval Latin contexts.

LMC 3104. The Age of Scientific Discovery. 3 Credit Hours.
Examines the relationships among texts representing the literary, artistic, and scientific thought of the fifteenth and sixteenth centuries.

LMC 3106. The Age of Scientific Revolution. 3 Credit Hours.
Examines interrelation of technological, literary, artistic, and philosophical thought in the late sixteenth and seventeenth centuries.

LMC 3112. Evolution and the Industrial Age. 3 Credit Hours.
Connects later nineteenth century scientific and technological concepts and discoveries, particularly theories of evolution, to the literature and culture of the industrial age.

LMC 3202. Studies in Fiction. 3 Credit Hours.
Examines the elements of fiction and what has made fiction, especially the novel, distinctive, popular, and enduring. Readings may include formal, cultural, and historical theories.

LMC 3204. Poetry and Poetics. 3 Credit Hours.
A study of traditions of poetic practice and poetic theory in English through intensive line by line readings of poems from different periods in literary history.

LMC 3206. Communication and Culture. 3 Credit Hours.
Examines ways in which forms and media of communication create and are created by other cultural constructs.

LMC 3208. African American Literature and Culture. 3 Credit Hours.
Explores the works of African American writers from the Colonial period to the present and examines a variety of cultural constructs that have fundamentally shaped the African American literary tradition.

LMC 3210. Ethnicity in American Culture. 3 Credit Hours.
Explores literary and historical works considering ethnic issues in American culture, including immigration, social assimilation, "double consciousness", the development of ethnic identity/pride, and multiculturalism.

LMC 3212. Women, Literature, and Culture. 3 Credit Hours.
Students in this course will analyze writings by women and examine feminist and other relevant cultural critiques of literature.

LMC 3214. Science Fiction. 3 Credit Hours.
Examines science fiction texts from the last 200 years to show how they reflect ambigous reactions to change.

LMC 3215. Science Fiction Film and Television. 3 Credit Hours.
This course investigates science fiction as the genre developed during film history and has become one of the most popular forms of television narrative.

LMC 3215R. LMC 3215 Recitation. 0 Credit Hours.
Film Screening for Science Fiction Film & Television.

LMC 3219. Literature and Medicine. 3 Credit Hours.
This course examines works of literature dealing overtly with illness and healing, works about or by physicians and other caregivers, and works that raise questions about ethical behavior in the face of sickness.

LMC 3225. Gender Studies in the Disciplines. 3 Credit Hours.
This course explores the concept of gender and its usefulness as a theoretical category in a variety of disciplines. It includes cultural studies of literature, communication media, cultural anthropology, sociology, history, and science.

LMC 3226. Major Authors. 3 Credit Hours.
An examination of the works and career of a major author in historical and cultural context.

LMC 3228. Shakespeare. 3 Credit Hours.
An examination of Shakespeare's works with attention to generic conventions, historical context, and the relationship of text and performance. Major works of Shakespeare's contemporaries are studied as appropriate.

LMC 3234. Creative Writing. 3 Credit Hours.
This course explores a range of creative literary genres, and combines study and analysis of existing modes of one or more forms in order to establish a basis for original creative work by class members.

LMC 3236. Writing for the Stage and Screen. 3 Credit Hours.
Basic principles of generating creative concepts, dramatic structure, character and dialogue development, and formatting for stage and screenplays.

LMC 3252. Studies in Film and Television. 3 Credit Hours.
Explores in depth a theoretical issue central to film and/or television. Among its concerns are authorship, genre history, spectatorship, ideology, narrative theory, and the relationship between these media and social history.

LMC 3252R. LMC 3252 Recitation. 0 Credit Hours.
Film Screening for Studies in Film & Television.

LMC 3253. Animation. 3 Credit Hours.
This course examines animation from its earliest days as a "cinema of attractions' to its current development as a predominantly digital practice.

LMC 3253R. LMC 3253 Recitation. 0 Credit Hours.
Film Screening for Animation.

LMC 3254. Film History. 3 Credit Hours.
Surveys the history of film from its machine origins to its present digital developments. It focuses on various movements, figures, and narrative developments in world cinema.

LMC 3254R. LMC 3254 Recitation. 0 Credit Hours.
Film Screening for Film History.

LMC 3255. Cinema and Digital Culture. 3 Credit Hours.
This course examines the impact of digital technologies on contemporary cinema as well as the influence of different cinematic traditions on new digital media.

LMC 3255R. LMC 3255 Recitation. 0 Credit Hours.
Film Screening for Cinema and Digital Culture.

LMC 3256. Major Filmmakers. 3 Credit Hours.
Traces in depth an individual artist's career and affords students the opportunity to immerse themselves in the works of an important figure in the world of film.

LMC 3256R. LMC 3256 Recitation. 0 Credit Hours.
Film Screening for Major Filmmakers.

LMC 3257. Global Cinema. 3 Credit Hours.
This course examines selected movements, styles, and trends in world cinema, emphasizing how contemporary film's global nature affects cultural representation.

LMC 3257R. LMC 3257 Recitation. 0 Credit Hours.
Film Screening for Global Cinema.

LMC 3258. Documentary Film. 3 Credit Hours.
This course examines significant movements, styles, and trends in fact-based film, emphasizing its cultural implications and formal strategies.

LMC 3258R. LMC 3258 Recitation. 0 Credit Hours.
Film Screening for Documentary Film.

LMC 3259. Experimental Film. 3 Credit Hours.
This course examines the history and trends in experimental film and video, emphasizing the relationship to avant-garde art movements.

LMC 3259R. LMC 3259 Recitation. 0 Credit Hours.
Experimental Film—Recitation.

LMC 3262. Performance Studies. 3 Credit Hours.
An examination of cultural theories of performance and their application to the analysis of specific performative events.

LMC 3263. Music, Culture, and Society. 3 Credit Hours.
Origins and development of contemporary popular music, including rock, trap, hip-hop, and other emerging and established forms.

LMC 3302. Science, Technology, and Ideology. 3 Credit Hours.
Examines specific scientific, philosophical, and literary/cultural texts in order to determine the role ideology plays in the construction of culture, especially scientific and technological culture.

LMC 3304. Science, Technology, and Gender. 3 Credit Hours.
Examines specific philosophical, scientific, and cultural texts to determine the role that gender has played in the scientific and technological knowledge, currently and historically.

LMC 3306. Science, Technology, and Race. 3 Credit Hours.
Examines specific historical and contemporary construction of race, within the prevailing scientific theories and ideologies in order to determine the role played by "race" in scientific and technological culture.

LMC 3308. Environmentalism and Ecocriticism. 3 Credit Hours.
Surveys the emergence of ecocriticism as an analytical framework for interpreting the verbal and visual rhetorics of environmentalism in both western and nonwestern cultures.

LMC 3310. The Rhetoric of Scientific Inquiry. 3 Credit Hours.
This course takes as its subject the ways in which argumentative and persuasive discourse is used to create and disseminate scientific knowledge.

LMC 3314. Technologies of Representation. 3 Credit Hours.
Explores historical, cultural, and theoretical issues related by technologies of representation, including written, spoken, and gestural languages; print, painting and illustration; still and moving photography; recorded sound; and computer mediated communications and interactive digital media.

LMC 3316. Science, Technology, and Postcolonialism. 3 Credit Hours.
Studies in the development of Postcolonial literary theory and historiography in order to analyze the interdependent discourses and practices of post-Enlightenment science/technology and European imperialism.

LMC 3318. Biomedicine and Culture. 3 Credit Hours.
Discuss the history of biology and medicine; popular representations of health, disease, and the medical establishment; and the cultural implications of medical imaging technologies.

LMC 3352. Film and/as Technology. 3 Credit Hours.
Examines the development of film technology and the implications of that technology for cinema's treatment of technology.

LMC 3352R. LMC 3352 Recitation. 0 Credit Hours.
Film Screening for Film And/As Technology.

LMC 3402. Graphic and Visual Design. 3 Credit Hours.
Introduction to fundamentals of graphic and visual design of print and digital media. Familiarity with use of the World Wide Web, page layout, and computer graphic software recommended.

LMC 3403. Technical Communication, Theory and Practice. 3 Credit Hours.
This course introduces students to workplace document genres to develop visual and verbal skills in critical analysis and document development.

LMC 3404. Social Media. 3 Credit Hours.
Students learn the cultural history, theory, and practice of social media in a variety of settings, and its impact on personal, professional, and political life.

LMC 3405. Media, Culture, and Society. 3 Credit Hours.
Examines the transformative impact of various kinds of media on culture, politics, communication, and education.

LMC 3406. Video Production. 3 Credit Hours.
An introduction to video production including basic skills in storyboarding, scripting, filming, editing, and sound.

LMC 3407. Advanced Video Production. 3 Credit Hours.
This production course teaches students to create visually compelling and emotionally powerful images through shot design and the use of lights, cameras and prime lenses.

LMC 3408. The Rhetoric of Technical Narratives. 3 Credit Hours.
Focuses on the rhetorical problems posed by such narrative documents as technical proposals, recommendations reports, grant proposals, and marketing studies. Emphasis on document design, graphics, navigation systems, and editing.

LMC 3410. The Rhetoric of Nonlinear Documents. 3 Credit Hours.
Focuses on the rhetorical problems posed by hypertext documents. Emphasis in designing for multiple audiences, page and document design, and navigation in a nonlinear environment.

LMC 3411. The Rhetoric of Visual Communication. 3 Credit Hours.
Focuses on contexts, audiences, arguements, and design in creating and critiquing visuals. Emphasizes topics such as information design, technical visuals, and photography.

LMC 3412. Communicating Science and Technology to the Public. 3 Credit Hours.
Examines both the theoretical and practical issues involved in communicating scientific and/or technological material to a variety of lay audiences.

LMC 3431. Technical Communication Approaches. 1 Credit Hour.
Part of a multi-semester sequence that students take in tandem with major-specific classes to develop professional written, visual, oral, and analytic strategies.

LMC 3432. Technical Communication Strategies. 2 Credit Hours.
Part of a multi-semester sequence that students take in tandem with major-specific classes to develop professional written, visual, oral, and analytic strategies.

LMC 3450. Blackness, Media, and Meaning-Making. 3 Credit Hours.
Considers the significance of Blackness in print, broadcast, and digital media.

LMC 3451. Race, Gender, and Digital Media. 3 Credit Hours.
Explores issues of race, ethnicity, and gender + the politics of technology (technoculture) in digital venues, social media, artificial intelligence, algorithms, and mundane digital phenomena.

LMC 3452. Introduction to Black Cultural Production. 3 Credit Hours.
Examines the communicative and cultural practices of Black mediated narratives across the Diaspora.

LMC 3453. Afrofuturism. 3 Credit Hours.
Students study Black cultural producers melding art and technology in science fiction and fantasy that reflect the complicated politics of envisioning the future.

LMC 3454. Producing Black Documentary Film and Podcasts. 3 Credit Hours.
Connects building healthy Black communities and Black economic empowerment within the framework of contemporary documentary filmmaking. Students will write, produce, edit, and distribute a mini-documentary.

LMC 3455. Major Topics in Black Media Studies. 3 Credit Hours.
Surveys the origins, development, and considers conventions through an investigation of major topics of black media and music.

LMC 3456. Technoculture. 3 Credit Hours.
Grounded in a critical race and cultural theoretic framework, the course explores systems and practices of scientific inquiry as mediated by Whiteness, imperialism, and modernity.

LMC 3457. Black Cultural Politics and the Southern Experience. 3 Credit Hours.
Investigate racial politics, social justice, and technocultural innovation across Atlanta and the American South.

LMC 3459. Afrofuturism and the Anthropocene. 3 Credit Hours.
Explores history and current status of Afrofuturism, a cultural movement, an epistemology, and an aesthetic centering Blackness and technology with visions for the future considering the Anthropocene.

LMC 3502. Ancient and Medieval Literature and Culture. 3 Credit Hours.
Introduction to Greece, Rome, and Medieval Europe through an examination of one or a few major culture conflicts expressed in the literary genres and periods.

LMC 3504. Renaissance Literature and Culture. 3 Credit Hours.
An examination of literature and culture from 1450 to 1650 with an emphasis on both major achievements and divergent voices.

LMC 3506. Enlightenment and Culture. 3 Credit Hours.
Examines the nature of the age from an intial boldness, optimism, and faith in reason to a recognition of its limits.

LMC 3511. American Literature & Culture. 3 Credit Hours.
Introduces students to American literature and culture broadly construed, examining foundational works of critical and historical significance.

LMC 3512. British and Continental Romanticism. 3 Credit Hours.
Examines British and Continental Romanticism as it appeared during the latter part of the eighteenth century and the first half of the nineteenth century.

LMC 3514. Victorian Literature and Culture. 3 Credit Hours.
Investigates the period 1830 - 1901 in English literature and culture, focusing on how that period defined key questions, especially ones about human nature, society, and the relation of religion to science.

LMC 3516. Literary and Cultural Modernism. 3 Credit Hours.
A partial investigation of the aesthetic ferment that characterizes English-language cultural production from the turn of the century to the end of World War II.

LMC 3518. Literary and Cultural Postmodernism. 3 Credit Hours.
A survey of major themes, representational techniques, and social and cultural concerns of postmodern art and literature.

LMC 3520. Contemporary Issues in Literature & Culture. 3 Credit Hours.
This course will cover a range of possible critical areas of global concern in contemporary literature and culture. Focus will vary each semester.

LMC 3661. Theatre Production III: Management. 1 Credit Hour.
In this "hands-on" course, students will create and execute a publicity campaign and operate the box office for DramaTech Theatre productions.

LMC 3662. Theatre Production IV: Acting. 1 Credit Hour.
This course providess students an opportunity to perform onstage in a production at DramaTech Theatre. Auditions are required.

LMC 3705. Principles of Information Design. 3 Credit Hours.
Presents principles and practices guiding the development of emerging digital genres. Emphasis on maximizing the affordances of the computer in organizing and communicating complex information.

LMC 3710. Principles of Interaction Design. 3 Credit Hours.
Examines principles of design for shaping the procedural and participatory affordances of digital environments, emphasizing the role of cultural context and media transitions.

LMC 3813. Special Topics. 3 Credit Hours.
Special Topics.

LMC 3XXX. Literature, Media, & Communication Elective. 1-21 Credit Hours.

LMC 4000. Senior Seminar in Literature, Media, and Communication. 3 Credit Hours.
Capstone seminar that asks majors to draw upon their training to engage in closer analysis, research, and/or production in topical area. Topic varies by instructor.

LMC 4102. Senior Thesis. 3 Credit Hours.
Preparation for and writing of a thesis through faculty-directed independent study.

LMC 4204. Poetry and Poetics II. 3 Credit Hours.
Advanced study of the traditions of poetic theory and practice with a special emphasis on processes of poetic conception and revision.

LMC 4406. Contemporary Issues in Professional Communication. 3 Credit Hours.
Intended primarily for students planning careers in professional communication, this course will alternate among a number of issues including property law, integrating print and electronic media, and cultural studies of corporate environments.

LMC 4407. Video Editing and Postproduction. 3 Credit Hours.
Introduction to Editing and Post Production develops the skills and knowledge of digital film post-production, concentrating on editing, editing theory, narrative editing, and post-production workflow.

LMC 4500. Seminar in Film Studies. 3 Credit Hours.
An in-depth investigation of a major movement, theory, period, or technological development in film studies.

LMC 4500R. LMC 4500 Recitation. 0 Credit Hours.
Film Screening for Seminar in Film.

LMC 4602. Performance Practicum. 3 Credit Hours.
Practical experience and theoretical investigations in theatre and performance making including acting, directing, designing, playwriting, performance art, performance and new media.

LMC 4698. Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

LMC 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

LMC 4701. Undergraduate Research Proposal Writing. 1 Credit Hour.
This course is intended to guide undergraduate students from all disciplines through the stages of writing a proposal for their research option project and thesis.

LMC 4702. Undergraduate Research Thesis Writing. 1 Credit Hour.
This course is intended to guide undergraduate students from all disciplines through the stages of writing their undergraduate thesis.

LMC 4710. Game Studio. 3 Credit Hours.
Project-based course in designing and implementing video games.

LMC 4720. Interactive Narrative. 3 Credit Hours.
Examines significant examples of this emerging genre, including its roots ini experimental uses of older media, and engages students in creating their own interactive narrative.

LMC 4725. Games Design as a Cultural Practice. 3 Credit Hours.
Emphasis is on the design elements common to games and the expressive possibilities and cultural concerns specific to digital games.

LMC 4730. Experimental Digital Art. 3 Credit Hours.
Provides students with key conceptual, formal, aesthetic and technical elements needed in creating artifacts in areas ranging from augmented and mixed reality to scientific visualization.

LMC 4731. Game AI. 3 Credit Hours.
Examines expressive possibilities of artificial intelligence techniques in computer games.

LMC 4733. Mixed Reality Experience Design. 3 Credit Hours.
Project-based course in designing implementing experiences using the technologies of Augmented, Mixed, and Virtual Reality. Credit not awarded for both LMC 4733 and CS 4770/6770/LMC 6340.

LMC 47XX. Lit, Media, & Comm Elective. 1-21 Credit Hours.

LMC 4811. Special Topics. 1 Credit Hour.
Topic of current interest not covered in the regular course offerings.

LMC 4812. Special Topics. 2 Credit Hours.
Topics of current interest not covered in the regular course offerings.

LMC 4813. Special Topics. 3 Credit Hours.
Topics of interest not covered in the regular course offerings.

LMC 4814. Special Topics. 4 Credit Hours.

LMC 4815. Special Topics. 5 Credit Hours.
Topics of interest not covered in the regular course offerings.

LMC 4904. Internship. 1-6 Credit Hours.
Offers students a workplace-based learning experience that stresses application of principles and skills gained in other STAC classes.

LMC 4XXX. Literature, Media, & Communication Elective. 1-21 Credit Hours.

LMC 6213. Edu Applications New. 3 Credit Hours.
This course introduces students to a variety of perspectives on learning as they apply to work in educational technology. Students cannot receive credit for LMC 6213 and LCC 6213.

LMC 6215. Issues in Media Studies. 3 Credit Hours.
This course focuses on the study of mass media from historical, theoretical, and cultural perspectives. Students cannot receive credit for LMC 6215 and LCC 6215.

LMC 6310. The Computer as an "Expressive Medium". 3 Credit Hours.
Explores the development of the representational power of the computer and the interplay between digital technology and culture. Students cannot receive credit for LMC 6310 and LCC 6310.

LMC 6311. Visual Culture and Design. 3 Credit Hours.
Explores visual media through a mutually instructive and integrated interplay between critical analyses and the creation of digital artifacts. Students cannot receive credit for LMC 6311 and LCC 6311.

LMC 6312. Design, Technology & Representation. 3 Credit Hours.
Explores historical, cultural, and theoretical issues raised by technologies of representation through critical analyses and the creation of digital artifacts. Students cannot receive credit for LMC 6312 and LCC 6312.

LMC 6313. Principles of Interaction Design. 3 Credit Hours.
Explores visual media through a mutually instructive and integrated interplay between critical analyses and the creation of digital artifacts. Students cannot receive credit for LMC 6313 and LCC 6313.

LMC 6314. Design of Networked Media. 3 Credit Hours.
Issues in hypertextual and multimedia design in networked environments, including the World Wide Web, interactive television, and wireless applications. Students cannot receive credit for LMC 6314 and LCC 6314.

LMC 6315. Product Production. 3 Credit Hours.
Focuses on defining user and client needs, analysis of competing products, budgeting, scheduling and management of the production process, and the design of the testing process. Students cannot receive credit for LMC 6315 and LCC 6315.

LMC 6316. Historical Approaches to Digital Media. 3 Credit Hours.
Examines digital media in the context of earlier media, such as handwriting and printing as well as photography, radio, film, and television. Students cannot receive credit for LMC 6316 and LCC 6316.

LMC 6317. Interactive Narrative/Fiction. 3 Credit Hours.
Students create interactive fictions in a variety of formats including intersecting story worlds, interactive characters, simulations, and replay worlds. Students cannot receive credit for LMC 6317 and LCC 6317, LMC 6317 and LCC 4720, or LMC 6317 and LMC 4720.

LMC 6318. Experimental Media. 3 Credit Hours.
Students will develop the critical, intellectual, and creative tools necessary to understand, work with, and reimagine design at the developmental stages of emerging technologies. Students cannot receive credit for LMC 6318 and LCC 6318.

LMC 6319. Intellectural Property Policy and Law. 3 Credit Hours.
Students examine constitutionally informed policy and pragmatic legal issues in intellectual property law, focusing on the effects of power structures and information digitization. Students cannot receive credit for LMC 6319 and LCC 6319.

LMC 6320. Globalization and New Media. 3 Credit Hours.
Historical and theoretical approach to the connections between modes of global integration and modes of representing information. Students cannot receive credit for LMC 6320 and LCC 6320.

LMC 6321. Architecture of Responsive Spaces. 3 Credit Hours.
Historical and theoretical approach to the connections between modes of global integration and modes of representing information. Students cannot receive credit for LMC 6321 and LCC 6321.

LMC 6322. Global Intellectual Property Policy and Law. 3 Credit Hours.
This course requires that students gain facility with intellectual property statutory and treaty law and understand US and global policies that affect power and access.

LMC 6325. Game Design and Analysis. 3 Credit Hours.
Focused topics in the theory and practice of game design, theory, and analysis, including issues of creation, and reception, such as a single sub-genre, procedural technique, or media tradition. Students cannot receive credit for LMC 6325 and LCC 6325, LMC 6325 and LCC 4725, or LMC 6325 and LMC 4725.

LMC 6330. Expressive Virtual Space. 3 Credit Hours.
Practical and theoretical investigation of virtual space in real-time 3D environments with a focus on meditation and functionality. Students cannot receive credit for LMC 6330 and LCC 6330.

LMC 6340. Mixed Reality Experience Design. 3 Credit Hours.
This course introduces students to the design of digital experienced for education and entertainment using Augmented Reality, Tangible Computing, or other forms of Mixed Reality. Students cannot receive credit for LMC 6340 and LCC 6340/LMC 4733/CS 6770/4770.

LMC 6350. The spatial construction of meaning: Design formulation and design cognition. 3 Credit Hours.
Study of the way in which space is manipulated to construct meaning in design formulation. Emphasis on logical structure, geometry, and experiential correlates. Students cannot receive credit for LMC 6350 and LCC 6350.

LMC 6360. Global Ethnographies and Communication Practices. 3 Credit Hours.
This course employs ethnographic methods to examine how the creation of visual, textual and digita; artifacts can be understood as practices of intercultural communication.

LMC 6366. Global Science Fiction. 3 Credit Hours.
Explores how authors and critics across the globe use science fiction to communicate experiences with science and technology across centuries, continents, and cultures.

LMC 6367. Literary and Cultural Theory. 3 Credit Hours.
Concentration on a single literary or cultural theorist and/or major school of literary or cultural theory, including, among others, Materialist, Feminist, Structuralist, Post-Structuralistm Cultural Studies.

LMC 6368. Global Cinema. 3 Credit Hours.
This course examines significant movements, styles, and trends in world cinema, with an emphasis on how the global nature of contemporary film affects cultural representation.

LMC 6399. Discovery & Invention. 3 Credit Hours.
Required course for all DM majors. The purpose of this course is to give students a suite of methods they can use in professional settings to discover opportunities for inventive new computational products and services. It complements the design and production skills developed in 6310 and 6313 with applied research skills. For students in the MS DM and MS HCI programs it will also help them in the development of their MS proposals. Students cannot receive credit for LMC 6399 and LCC 6399.

LMC 6650. Project Studio. 3 Credit Hours.
This course offers students the opportunity to work on focused research within existing long-term projects of the New Media(NM) Center.

LMC 6743. STS Core Seminar. 3 Credit Hours.
This survey course covers key works Science, Technology & Society, and guest lectures introduce students to faculty doing STS-related research across the Ivan Allen College. Students cannot receive credit for LMC 6743 and LCC 6743, LMC 6743 and HTS 6743, or LMC 6743 and PUBP 6743.

LMC 6748. Social Justice, Critical Theory, and Philosophy of Design. 3 Credit Hours.
Focuses on social justice from a Science, Technology, and Society(STS) point of view that is informed by critical theory and philosophy of design. Students cannot receive credit for LMC 6748 and LCC 6748 or LMC 6748 and PUBP 6748.

LMC 6749. Feminist Theory and STS. 3 Credit Hours.
This course is an advanced science, technology and society (STS) seminar in feminist theory. Students cannot receive credit for LMC 6749 and LCC 6749 or LMC 6749 and PUBP 6749.

LMC 6753. Human-Computer Interaction Professional Preparation and Practice. 1 Credit Hour.
Preparation for a professional career in HCI. Hands-on workshops in resume and portfolio building, interviewing, public speaking, team work. HCI career choices and trajectories.

LMC 6770. Mixed Reality Design. 3 Credit Hours.
This course introduces students to mixed reality design and prototyping with a focus on Augmented Reality. Students cannot receive credit for LMC 6770 and CS 4770.

LMC 6800. Digital Media Master's Project. 3 Credit Hours.
Final project course in Digital Media.

LMC 6998. HCI Master's Project. 1-9 Credit Hours.
Final project for students completing a Human-Computer Interaction master's degree in the Digital Media track. Repeatable for multi-semester projects.

LMC 6XXX. Literature, Media, & Communication Elective. 1-21 Credit Hours.

LMC 7000. Digital Media Master's Thesis. 1-21 Credit Hours.
Final Thesis course in Digital Media.

LMC 7999. PhD Qualifying Prep. 1-21 Credit Hours.
Preparation for Ph.D. Qualifying exam.

LMC 8000. Proseminar in Media Theory. 3 Credit Hours.
Key traditions of media theory that contribute to the study of Digital Media. Students cannot receive credit for LMC 8000 and LCC 8000.

LMC 8001. Proseminar in Digital Media Studies. 3 Credit Hours.
Advanced work in production and critique of new media forms. Students cannot receive credit for LMC 8001 and LCC 8001.

LMC 8801. Special Topics. 1 Credit Hour.
Topic of current interest not covered in the regular course offerings.

LMC 8803. Special Topics in Digital Media. 3 Credit Hours.
Special Topics in Digital Media.

LMC 8813. Advanced Issues in Interactive Narrative. 3 Credit Hours.
Advanced Issues in Interactive Narrative.

LMC 8823. Special Topics in Game Design and Analysis. 3 Credit Hours.
Advanced topics in the theory and practice of game design, theory, and analysis, including creation, reception, procedural technique, and tradition.

LMC 8831. Special Topics in Technologies of Representation. 1 Credit Hour.
Special Topics in Technologies of Representation.

LMC 8903. Special Problems in Human-Computer Interaction. 1-3 Credit Hours.
Small-group of individual investigation of advanced topics in human-computer interaction. Guided study and research.

LMC 8910. Special Problems in Information Design and Technology. 1-21 Credit Hours.
An independent study course.

LMC 8997. Teaching Assistantship. 1-9 Credit Hours.
For graduate students holding teaching assistantships.

LMC 8998. Research Assistantship. 1-9 Credit Hours.
For graduate students holding research assistantships.

LMC 8999. PhD Doctoral Prep. 1-21 Credit Hours.
Doctoral Thesis Prep in Digital Media.

LMC 9000. Doctoral dissertation in Digital Media. 1-21 Credit Hours.
Doctoral Dissertation.

Learning Support (LS)

LS 0198. Reading Skills. 3 Credit Hours.
Development of reading comprehension and speed, vocabulary, and study skills. Review of grammar and usage.

LS 0298. English Skills. 3 Credit Hours.
Development of basic skills used in writing the sentence, paragraph, and short essay. Development of reading speed.

LS 0398. Mathematical Skills. 3 Credit Hours.
Intense review of arithmetic and algebra skills. Development of mathematics study skills.

Mathematics (MATH)

MATH 0399. Support for Precalculus. 2 Credit Hours.
Practicum for Learning Support students enrolled in MATH 1113 (Precalculus).

MATH 0999. Support for College Algebra. 2 Credit Hours.
This Learning Support course provides corequisite support in mathematics for students enrolled in MATH 1111. Topics will parallel topics being studied in MATH 1111 and the essential quantitative skills needed to be successful.

MATH 1111. College Algebra. 4 Credit Hours.
This course is symbolically intensive, functional approach to algebra that incorporates the use of appropriate technology. Emphasis will be placed on the study of functions and their graphs, inequalities, and linear, quadratic, piece-wise defined, rational, polynomial, exponential, and logarithmic functions. Appropriate applications will be included.

MATH 1113. Precalculus. 4 Credit Hours.
Analytic geometry, the function concept, polynomials, exponential, logarithms, trigonometric functions, mathematical induction, and the theory of equations. May only be used for degree credit with departmental approval.

MATH 11X3. Transfer Precalculus. 3 Credit Hours.

MATH 1501. Calculus I. 4 Credit Hours.
Differential calculus and basic integral calculus including the fundamental theorem of calculus. Credit not allowed for both MATH 1501 and 1712.

MATH 1503. Calculus I for the Life Sciences. 4 Credit Hours.
Differential and basic calculus: sequences, difference equations, limits, continuity, differentiation, integration, applications. The topics parallel those of MATH 1501 with applications from life sciences.

MATH 1504. Calculus I for the Life Sciences. 4 Credit Hours.
Taylor approximations, introduction to differential equations, linear algebra, and introduction to multivariable calculus. Motivating examples drawn from life sciences.

MATH 1512. Honors Calculus II. 4 Credit Hours.
The topics covered parallel those of 1502 with a somewhat more intensive and rigorous treatment. Credit not allowed for both honors calculus and the corresponding regular calculus course. Credit not allowed for both MATH 1512 and MATH 1522. Credit not allowed for both MATH 1512 and MATH 15X2.

MATH 1550. Introduction to Differential Calculus. 3 Credit Hours.
An introduction to differential calculus including applications and the underlying theory of limits for functions and sequences. Credit not awarded for both MATH 1550 and MATH 1501, MATH 1551, or MATH 1503.

MATH 1551. Differential Calculus. 2 Credit Hours.
Differential calculus including applications and the underlying theory of limits for functions and sequences. Credit not awarded for both MATH 1551 and MATH 1501, MATH 1503, or MATH 1550.

MATH 1552. Integral Calculus. 4 Credit Hours.
Integral calculus: Definite and indefinite integrals, techniques of integration, improper integrals, infinite series, applications. Credit not awarded for both MATH 1552 and MATH 1502, MATH 1504, MATH 1512 or MATH 1555.

MATH 1553. Introduction to Linear Algebra. 2 Credit Hours.
An introduction to linear alegbra including eigenvalues and eigenvectors, applications to linear systems, least squares. Credit not awarded for both MATH 1553 and MATH 1522, MATH 1502, MATH 1504, MATH 1512, MATH 1554 or MATH 1564.

MATH 1554. Linear Algebra. 4 Credit Hours.
Linear algebra eigenvalues, eigenvectors, applications to linear systems, least squares, diagnolization, quadratic forms.

MATH 1555. Calculus for Life Sciences. 4 Credit Hours.
Overview of intergral calculus, multivariable calculus, and differential equations for biological sciences. Credit not awarded for both MATH 1555 and MATH 1552, MATH 1502, MATH 1504, MATH 1512 or MATH 2550.

MATH 1564. Linear Algebra with Abstract Vector Spaces. 4 Credit Hours.
This is an intensive first course in linear algebra including the theories of linear transformations and abstract vector spaces. Credit not awarded for both MATH 1564 and MATH 1553, MATH 1554, MATH 1522, MATH 1502, MATH 1504 or MATH 1512.

MATH 15X1. Transfer Calculus I. 3 Credit Hours.

MATH 15X2. Transfer Calculus II. 3,4 Credit Hours.
This course includes the treatment of single variable calculus in MATH 1502. This course is not equivalent to MATH 1502. Credit not allowed for both MATH 15X2 and MATH 1502. Credit not allowed for both MATH 15X2 and MATH 1512.

MATH 1601. Introduction to Higher Mathematics. 3 Credit Hours.
This course is designed to teach problem solving and proof writing. Mathematical subject matter is drawn from elementary number theory and geometry.

MATH 1711. Finite Mathematics. 4 Credit Hours.
Linear equations, matrices, linear programming, sets and counting, probability and statistics.

MATH 1712. Survey of Calculus. 4 Credit Hours.
Techniques of differentiation, integration, application of integration to probability and statistics, multidimensional calculus. Credit not allowed for both MATH 1712 and 1501.

MATH 17X1. Transfer Finite Math. 3 Credit Hours.

MATH 17X2. Transfer Survey-Calc. 3 Credit Hours.

MATH 1803. Special Topics. 3 Credit Hours.
Courses on special topics of current interest in Mathematics.

MATH 1X51. Transfer Differential Calc. 2,3 Credit Hours.

MATH 1X52. Transfer Integral Calculus. 3,4 Credit Hours.

MATH 1X53. Transfer Intro Linear Algebra. 2,3 Credit Hours.

MATH 1X54. Transfer Linear Algebra. 2,3 Credit Hours.

MATH 1X55. Transfer Calculus for Life Sci. 2,3 Credit Hours.

MATH 1XXX. Mathematics Elective. 1-21 Credit Hours.

MATH 2106. Foundations of Mathematical Proof. 3 Credit Hours.
An introduction to proofs in advanced mathematics, intended as a transition to upper division courses including Abstract Algebra I and Analysis I.

MATH 2406. Abstract Vector Spaces. 3 Credit Hours.
A proof-based development of linear algebra and vector spaces, with additional topics such as multilinear algebra and group theory.

MATH 24X1. Transfer Calculus III. 3 Credit Hours.

MATH 24X3. Transfer Diff Equations. 3 Credit Hours.

MATH 2550. Introduction to Multivariable Calculus. 2 Credit Hours.
Vectors in three dimensions, curves in space, functions of several variables, partial derivatives, optimization, integration of functions of several variables. Vector Calculus not covered. Credit will not be awarded for both MATH 2550 and MATH 2605 or MATH 2401 or MATH 2551 or MATH 1555.

MATH 2551. Multivariable Calculus. 4 Credit Hours.
Multivariable calculus: Linear approximation and Taylor's theorems, Lagrange multiples and constrained optimization, multiple integration and vector analysis including the theorems of Green, Gauss, and Stokes. Credit will not be awarded for both MATH 2551 and MATH 2401 or MATH 2411 or MATH 2561.

MATH 2552. Differential Equations. 4 Credit Hours.
Methods for obtaining numerical and analytic solutions of elementary differential equations. Applications are also discussed with an emphasis on modeling. Credit not awarded for both MATH 2552 and MATH 2403 or MATH 2413 or MATH 2562.

MATH 2561. Honors Multivariable Calculus. 4 Credit Hours.
The topics covered parallel those of MATH 2551 with a somewhat more intensive and rigorous treatment. Credit not awarded for both MATH 2561 and MATH 2401 or MATH 2411 or MATH 2551.

MATH 2562. Honors Differential Equations. 4 Credit Hours.
The topics covered parallel those of MATH 2552 with a somewhat more intensive and rigorous treatment.

MATH 2603. Introduction to Discrete Mathematics. 4 Credit Hours.
Mathematical logic and proof, mathematical induction, counting methods, recurrence relations, algorithms and complexity, graph theory and graph algorithms. Credit not awarded for both MATH 2603 and MATH 2602.

MATH 2605. Calculus III for Computer Science. 4 Credit Hours.
Topics in linear algebra and multivariate calculus and their applications in optimization and numerical methods, including curve fitting, interpolation, and numerical differentiation and integration.

MATH 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

MATH 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

MATH 26X2. Transfer Linear & Disc Math. 3 Credit Hours.

MATH 26X3. Transfer Discrete Math. 3 Credit Hours.

MATH 2801. Special Topics. 1 Credit Hour.
Courses on special topics of current interest in mathematics.

MATH 2802. Special Topics. 2 Credit Hours.
Courses on special topics of current interest in mathematics.

MATH 2803. Special Topics. 3 Credit Hours.
Courses on special topics of current interest in mathematics.

MATH 2804. Special Topics. 4 Credit Hours.
Courses on special topics of current interest in mathematics.

MATH 2805. Special Topics. 5 Credit Hours.
Courses on special topics of current interest in mathematics.

MATH 2X51. Transfer Multivariable Calc. 3,4 Credit Hours.

MATH 2X52. Transfer Differential Equation. 3,4 Credit Hours.

MATH 2XXX. Mathematics Elective. 1-21 Credit Hours.

MATH 3012. Applied Combinatorics. 3 Credit Hours.
Elementary combinatorial techniques used in discrete problem solving: counting methods, solving linear recurrences, graph and network models, related algorithms, and combinatorial designs.

MATH 3012R. Applied Combinatorics Recitation. 0 Credit Hours.
Recitation for MATH 3012.

MATH 3022. Honors Applied Combinatorics. 3 Credit Hours.
Topics are parallel to those of MATH 3012 with a more rigorous and intensive treatment. Credit is not allowed for both MATH 3012 and 3022.

MATH 3215. Introduction to Probability and Statistics. 3 Credit Hours.
This course is a problem-oriented introduction to the basic concepts of probability and statistics, providing a foundation for applications and further study.

MATH 3225. Honors Probability and Statistics. 3 Credit Hours.
The topics covered parallel those of MATH 3215, with a more rigorous and intensive treatment. Credit is not allowed for both MATH 3215 and 3225.

MATH 3235. Probability Theory. 3 Credit Hours.
This course is a mathematical introduction to probability theory, covering random variables, moments, multivariable distributions, law of large numbers, central limit theorem, and large deviations. Credit not awarded for both MATH 3235 and MATH 3215 or 3225 or 3670.

MATH 3236. Statistical Theory. 3 Credit Hours.
An introduction to theoretical statistics for students with a background in probability. A mathematical formalism for inference on experimental data will be developed. Credit not awared for both MATH 3236 and MATH 3215 or 3225 or 3670.

MATH 3406. A Second Course in Linear Algebra. 3 Credit Hours.
This course will cover important topics in linear algebra not usually discussed in a first-semester course, featuring a mixture of theory and applications.

MATH 3670. Probability and Statistics with Applications. 3 Credit Hours.
Introduction to probability, probability distributions, point estimation, confidence intervals, hypothesis testing, linear regression and analysis of variance. Students cannot receive credit for both MATH 3670 and MATH 3770 or ISYE 3770 or CEE 3770.

MATH 3801. Special Topics. 1 Credit Hour.
Courses on special topics of current interest in mathematics.

MATH 3802. Special Topics. 2 Credit Hours.
Courses on special topics of current interest in mathematics.

MATH 3803. Special Topics. 3 Credit Hours.
Courses on special topics of current interest in mathematics.

MATH 3804. Special Topics. 4 Credit Hours.
Courses on special topics of current interest in mathematics.

MATH 3805. Special Topics. 5 Credit Hours.
Courses on special topics of current interest in mathematics.

MATH 3XXX. Mathematics Elective. 1-21 Credit Hours.

MATH 4012. Algebraic Structures in Coding Theory. 3 Credit Hours.
Introduction to linear error correcting codes with an emphasis on the algebraic tools required, including matrices vector spaces, groups, polynomial rings, and finite fields.

MATH 4022. Introduction to Graph Theory. 3 Credit Hours.
The fundamentals of graph theory: trees, connectivity, Euler torus, Hamilton cycles, matchings, colorings, and Ramsey theory.

MATH 4032. Combinatorial Analysis. 3 Credit Hours.
Combinatorial problem-solving techniques including the use of generating functions, recurrence relations, Polya theory, combinatorial designs, Ramsey theory, matroids, and asymptotic analysis.

MATH 4080. Senior Project I. 2 Credit Hours.
The first of a two-course sequence of faculty-directed independent research culminating in the writing of a senior thesis and its presentation.

MATH 4090. Senior Project II. 2 Credit Hours.
The second course of a two-course sequence of faculty-directed independent research culminating in the writing of a senior thesis and its presentation.

MATH 4107. Introduction to Abstract Algebra I. 3 Credit Hours.
This course develops in the theme of "Arithmetic congruence and abstract algebraic structures". Strong emphasis on theory and proofs.

MATH 4108. Introduction to Abstract Algebra II. 3 Credit Hours.
Continuation of Abstract Algebra I, with emphasis on Galois theory, modules, polynomial fields, and the theory of linear associative algebra.

MATH 4150. Introduction to Number Theory. 3 Credit Hours.
Primes and unique factorization, congruences, Chinese remainder theorem, Diophantine equations, Diophantine approximations, quadratic reciprocity. Applications such as fast multiplication, factorization, and encryption.

MATH 4210. Mathematical Foundations of Data Science. 3 Credit Hours.
Data science methods and their mathematical foundations: linear regression, classification, and clustering, kernel methods, regression trees and ensemble methods, dimension reduction.

MATH 4221. Stochastic Processes I. 3 Credit Hours.
Simple random walk and the theory of discrete time Markov chains.

MATH 4222. Stochastic Processes II. 3 Credit Hours.
Renewal theory, Poisson processes and continuous time Markov processes, including an introduction to Brownian motion and martingales.

MATH 4255. Monte Carlo Methods. 3 Credit Hours.
Probability distributions, limit laws, and applications through the computer.

MATH 4261. Mathematical Statistics I. 3 Credit Hours.
Sampling distributions, Normal, t, chi-square, and f distributions. Moment-generating function methods, Bayesian estimation, and introduction to hypothesis testing.

MATH 4262. Mathematical Statistics II. 3 Credit Hours.
Hypothesis testing, likelihood ratio tests, nonparametric tests, bivariate and multivariate normal distributions.

MATH 4280. Introduction to Information Theory. 3 Credit Hours.
The measurement and quantification of information. These ideas are applied to the probabilistic analysis of the transmission of information over a channel along which random distortion of the message occurs.

MATH 4305. Topics in Linear Algebra. 3 Credit Hours.
Finite dimensional vector spaces, inner product spaces, least squares, linear transformations, the spectral theorem for normal transformations. Applications to convex sets, positive matrices, difference equations.

MATH 4317. Analysis I. 3 Credit Hours.
Real numbers, topology of Euclidean spaces, Cauchy sequences, completeness, continuity and compactness, uniform continuity, series of functions, Fourier series.

MATH 4318. Analysis II. 3 Credit Hours.
Differentiation of functions of one real variable, Riemann-Stieltjes integral, the derivative in Rn, and integration in Rn.

MATH 4320. Complex Analysis. 3 Credit Hours.
Topics from complex function theory, including contour integration and conformal mapping.

MATH 4347. Partial Differential Equations I. 3 Credit Hours.
Method of characteristics for first- and second-order partial differential equations, conservation laws and shocks, classification of second-order systems and applications.

MATH 4348. Partial Differential Equations II. 3 Credit Hours.
Green's functions and fundamental solutions. Potential, diffusion, and wave equations.

MATH 4431. Introductory Topology. 3 Credit Hours.
Point set topology, topological spaces and metric spaces, continuity and compactness, homotopy, and covering spaces.

MATH 4432. Introduction to Algebraic Topology. 3 Credit Hours.
Introduction to algebraic methods in topology. Includes homotopy, the fundamental group, covering spaces, simplicial complexes. Applications to fixed point theory and group theory.

MATH 4441. Differential Geometry. 3 Credit Hours.
The theory of curves, surfaces, and more generally, manifolds. Curvature, parallel transport, covariant differentiation, Gauss-Bonet theorem.

MATH 4541. Dynamics and Bifurcations I. 3 Credit Hours.
A broad introduction to the local and global behavior of nonlinear dynamical systems arising from maps and ordinary differential equations.

MATH 4542. Dynamics and Bifurcations II. 3 Credit Hours.
A continuation of Dynamics and Bifurcations I.

MATH 4580. Linear Programming. 3 Credit Hours.
A study of linear programming problems, including the simplex method, duality, and sensitivity analysis with applications to matrix games, interger programming, and networks.

MATH 4581. Classical Mathematical Methods in Engineering. 3 Credit Hours.
The Laplace transform and applications, Fourier series, boundary value problems for partial differential equations.

MATH 4640. Numerical Analysis I. 3 Credit Hours.
Introduction to numerical algorithms for some basic problems in computational mathematics. Discussion of both implementation issues and error analysis.

MATH 4641. Numerical Analysis II. 3 Credit Hours.
Introduction to the numerical solution of initial and boundary value problems in differential equations.

MATH 4695. Undergraduate Internship. 1-21 Credit Hours.
Undergraduate internship for academic credit.

MATH 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

MATH 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

MATH 4755. Mathematical Biology. 3 Credit Hours.
Problems from the life sciences and the mathematical methods for solving them are presented. The underlying biological and mathematical principles and the interrelationships are emphasized. Crosslisted with BIOL 4755.

MATH 4777. Vector and Parallel Scientific Computation. 3 Credit Hours.
Scientific computational algorithms on vector and parallel computers. Speed-up and algorithm complexity, interprocesses communication, synchronization, modern algorithms for linear systems, programming techniques, code optimization. Crosslisted with CS 4777.

MATH 4782. Quantum Information and Quantum Computing. 3 Credit Hours.
Introduction to quantum computing and quantum information theory, formalism of quantum mechanics, quantum gates, algorithms, measurements, coding, and information. Physical realizations and experiments. Crosslisted with PHYS 4782.

MATH 4801. Special Topics. 1 Credit Hour.
Courses on special topics of current interest in mathematics.

MATH 4802. Special Topics. 2 Credit Hours.
Courses on special topics of current interest in mathematics.

MATH 4803. Special Topics. 3 Credit Hours.
Courses on special topics of current interest in mathematics.

MATH 4804. Special Topics. 4 Credit Hours.
Courses on special topics of current interest in mathematics.

MATH 4805. Special Topics. 5 Credit Hours.
Courses on special topics of current interest in mathematics.

MATH 4873. Special Topics. 3 Credit Hours.
This course enables the school of Mathematics to comply with requests for courses in selected topics.

MATH 4999. Reading or Research. 1-21 Credit Hours.
Reading or research in topics of current interest.

MATH 4XXX. Mathematics Elective. 1-21 Credit Hours.

MATH 6001. Introduction to Graduate Studies in Mathematics. 2 Credit Hours.
This course covers practical information helping students start their careers as a professional mathematician. It also satisfies the Georgia Tech RCR requirements for "in-person" training.

MATH 6014. Graph Theory and Combinatorial Structures. 3 Credit Hours.
Fundamentals, connectivity, matchings, colorings, extremal problems, Ramsey theory, planar graphs, perfect graphs. Applications to operations research and the design of efficient algorithms.

MATH 6021. Topology of Euclidean Spaces. 3 Credit Hours.
Metric spaces, normed linear spaces, convexity, and separation; polyhedra and simplicial complexes; surfaces; Brouwer fixed point theorem.

MATH 6112. Advanced Linear Algebra. 3 Credit Hours.
An advanced course in Linear Algebra and applications.

MATH 6121. Modern Abstract Algebra I. 3 Credit Hours.
Graduate-level linear and abstract algebra including groups, finite fields, classical matrix groups and bilinear forms, multilinear algebra, and matroids. First of two courses.

MATH 6122. Modern Abstract Algebra II. 3 Credit Hours.
Graduate-level linear and abstract algebra including rings, fields, modules, some algebraic number theory and Galois theory. Second of two courses.

MATH 6221. Probability Theory for Scientists and Engineers. 3 Credit Hours.
Classical introduction to probability theory including expectation, notions of convergence, laws of large numbers, independence, large deviations, conditional expectation, martingales, and Markov chains.

MATH 6235. Stochastic Processes in Finance II. 3 Credit Hours.
Advanced mathematical modeling of financial markets, derivative securities pricing, and portfolio optimization. Concepts from advanced probability and mathematics are introduced as needed.

MATH 6241. Probability I. 3 Credit Hours.
Develops the probability basis requisite in modern statistical theories and stochastic processes. Topics of this course include measure and integration foundations of probability, distribution functions, convergence concepts, laws of large numbers, and central limit theory. First of two courses.

MATH 6242. Probability II. 3 Credit Hours.
Develops the probability basis requisite in modern statistical theories and stochastic processes. Topics of this course include results for sums of independent random variables, Markov processes, martingales, Poisson processes, Brownian motion, conditional probability and conditional expectation, and topics from ergodic theory. Second of two classes.

MATH 6262. Advanced Statistical Inference I. 3 Credit Hours.
Basic theories of statistical estimation, including optimal estimation in finite samples and asymptotically optimal estimation. A careful mathematical treatment of the primary techniques of estimation utilized by statisticians.

MATH 6263. Testing Statistical Hypotheses. 3 Credit Hours.
Basic theories of testing statistical hypotheses, including a thorough treatment of testing in exponential class families. A careful mathematical treatment of the primary techniques of hypothesis testing utilized by statisticians.

MATH 6266. Linear Statistical Models. 3 Credit Hours.
Basic unifying theory underlying techniques of regression, analysis of variance and covariance, from a geometric point of view. Modern computational capabilities are exploited fully. Students apply the theory to real data through canned and coded programs.

MATH 6267. Multivariate Statistical Analysis. 3 Credit Hours.
Multivariate normal distribution theory, correlation and dependence analysis, regression and prediction, dimension-reduction methods, sampling distributions and related inference problems, selected applications in classification theory, multivariate process control, and pattern recognition.

MATH 6307. Ordinary Differential Equations I. 3 Credit Hours.
This sequence develops the qualitative theory for systems of ordinary differential equations. Topics include stability, Lyapunov functions, Floquet theory, attractors, invariant manifolds, bifurcation theory, normal forms. First of two courses.

MATH 6308. Ordinary Differential Equations II. 3 Credit Hours.
This sequence develops the qualitative theory for systems of differential equations. Topics include stability, Lyapunov functions, Floquet theory, attractors, invariant manifolds, bifurcation theory, and normal forms. Second of two courses.

MATH 6321. Functions of a Complex Variable I. 3 Credit Hours.
Complex integration, including Goursat's theorem; classification of singularities, the argument principle, the maximum principle; Riemann Mapping theorem; analytic continuation and Riemann surfaces; range of an analytic function, including Picard's theorem.

MATH 6337. Real Analysis I. 3 Credit Hours.
Lebesgue measure and integration, differentiation, abstract measure theory. Credit cannot be received for both MATH 6337 and MATH 6579.

MATH 6338. Real Analysis II. 3 Credit Hours.
Continuation of MATH 6337. L^p and Hilbert spaces, introduction to operator theory and functional analysis. Credit cannot be received for both MATH 6338 and MATH 6580.

MATH 6341. Partial Differential Equations I. 3 Credit Hours.
Introduction to the mathematical theory of partial differential equations covering the basic linear models of science and exact solution techniques.

MATH 6342. Partial Differential Equations II. 3 Credit Hours.
This course covers the general mathematical theory of linear stationary and evolution problems plus selected topics chosen from the instructor's interests.

MATH 6421. Algebraic Geometry I. 3 Credit Hours.
The study of zero sets of polynomials: algebraic varieties, regular and rational mappings, the Zariski topology.

MATH 6422. Algebraic Geometry II. 3 Credit Hours.
A continuation of Algebraic Geometry I.

MATH 6441. Algebraic Topology I. 3 Credit Hours.
Simplicial homology. Chain complexes and acyclic carriers. Simplicial approximation. The exact homology sequence. Maps of spheres. Mayer-Vietoris sequence.

MATH 6442. Algebraic Topology II. 3 Credit Hours.
Continuation of MATH 6441. Singular homology. Local homology and manifolds. CW complexes. Cohomology. Duality in manifolds.

MATH 6451. General Topology. 3 Credit Hours.
Introduction to topological and metric spaces. Continuity, compactness, convergence, completion. Product and quotient spaces. Elementary homotopy.

MATH 6452. Differential Topology. 3 Credit Hours.
Manifolds. Differentiable structures. Tangent bundles. Embeddings and immersions. Maps on manifolds. Transversality. Morse-Sard Theorem. Vector bundles.

MATH 6453. Geometric Topology. 3 Credit Hours.
Characteristic classes, Morse theory, three-manifolds, four-manifolds, symplectic and contact manifolds, knot theory.

MATH 6455. Differential Geometry I. 3 Credit Hours.
Core topics in differential, including: Lie groups, curvature, and relations with topology.

MATH 6456. Differential Geometry II. 3 Credit Hours.
Introduces students to topics of current interest in geometry.

MATH 6514. Industrial Mathematics I. 3 Credit Hours.
Applied mathematics techniques to solve real-world problems. Topics include mathematical modeling, asymptotic analysis, differential equations and scientific computation. Prepares the student for MATH 6515.

MATH 6579. Measure Theory for Scientists and Engineers. 3 Credit Hours.
An introduction to measure theory and Lebesgue integration with a focus on topics that tend to be of the most utility in science and engineering. Credit cannot be received for both MATH 6337 and MATH 6579.

MATH 6580. Hilbert Spaces for Scientists and Engineers. 3 Credit Hours.
Structure of linear operators in infinite dimensional spaces, applications. Credit cannot be received for both MATH 6338 and MATH 6580.

MATH 6583. Integral Equations and Transforms. 3 Credit Hours.
Volterra and Fredholm linear integral equations; relation to differential equations; solution methods; Fourier, Laplace, and Mellin transforms; applications to boundary value problems and integral equations.

MATH 6584. Special Functions of Higher Mathematics. 3 Credit Hours.
Gamma function; exponential function; orthogonal polynomials; Bessel, Legendre, and hypergeometric functions; application to singular ordinary differential equations; and separation of variables for partial differential equations.

MATH 6635. Numerical Methods in Finance. 3 Credit Hours.
Basic numerical and simulation techniques used in the pricing of derivative securities and in related problems in finance. Some programming experience required.

MATH 6640. Introduction to Numerical Methods for Partial Differential Equations. 3 Credit Hours.
Introduction to the implementation and analysis of numerical algorithms for the numerical solution of the classic partial differential equations of science and engineering. Must have knowledge of a computer programming language, familiarity with partial differential equations and elements of scientific computing.

MATH 6641. Advanced Numerical Methods for Partial Differential Equations. 3 Credit Hours.
Analysis and implementation of numerical methods for nonlinear partial differential equations including elliptic, hyperbolic, and/or parabolic problems. Must have knowledge of classic linear partial differential equations and exposure to numerical methods for partial differential equations at the level of MATH 6640 or numerical linear algebra at the level of MATH 6643.

MATH 6643. Numerical Linear Algebra. 3 Credit Hours.
Introduction to the numerical solution of the classic problems of linear algebra including linear systems, least squares, Singular value decomposition, eigenvalue problems. Crosslisted with CSE 6643.

MATH 6644. Iterative Methods for Systems of Equations. 3 Credit Hours.
Iterative methods for linear and nonlinear systems of equations including Jacobi, G-S, SOR, CG, multigrid, Newton quasi-Newton, updating, and gradient-based methods. Crosslisted with CSE 6644.

MATH 6645. Numerical Approximation Theory. 3 Credit Hours.
Theoretical and computational aspects of polynomial, rational, trigonometric, spline, and wavelet approximation.

MATH 6646. Numerical Methods for Ordinary Differential Equations. 3 Credit Hours.
Analysis and implementation of numerical methods for initial and two-point boundary value problems for ordinary differential equations.

MATH 6647. Numerical Methods for Dynamical Systems. 3 Credit Hours.
Approximation of the dynamical structure of a differential equation and preservation of dynamical structure under discretization. Must be familiar with dynamical systems and numerical methods for initial and boundary value problems in ordinary differential equations.

MATH 6701. Math Methods of Applied Sciences I. 3 Credit Hours.
Review of linear algebra and ordinary differential equations, brief introduction to functions of a complex variable.

MATH 6702. Math Methods of Applied Sciences II. 3 Credit Hours.
Review of vector calculus and its applications to partial differential equations.

MATH 6705. Modeling and Dynamics. 3 Credit Hours.
Mathematical methods for solving problems in the life sciences. Models-based course on basic facts from the theory of ordinary differential equations and numerical methods of their solution. Introduction to the control theory, diffusion theory, maximization, minimization and curve fitting. Math majors may not use this course toward any degree in the School of Mathematics.

MATH 6710. Numerical Methods in Computational Science and Engineering I. 3 Credit Hours.
Introduction to numerical algorithms widely used in computational science and engineering. Numerical linear algebra, linear programming, and applications. Crosslisted with CSE 6710.

MATH 6711. Numerical Methods in Computational Science and Engineering II. 3 Credit Hours.
Efficient numerical techniques for solving partial differential equations and large-scale systems of equations arising from discretization of partial differential equations or variational problems in applications in science and engineering. Crosslisted with CSE 6711.

MATH 6759. Stochastic Processes in Finance I. 3 Credit Hours.
Mathematical modeling of financial markets, derivative securities pricing, and portfolio optimization. Concepts from probability and mathematics are introduced as needed. Crosslisted with ISYE 6759.

MATH 6761. Stochastic Processes I. 3 Credit Hours.
Discrete time Markov chains, Poisson processes, and renewal processes. Transient and limiting behavior. Average cost and utility measures of systems. Algorithms for computing performance measures. Modeling of inventories, and flows in manufacturing and computer networks. Crosslisted with ISYE 6761.

MATH 6762. Stochastic Processes II. 3 Credit Hours.
Continuous time Markov chains. Uniformization, transient and limiting behavior. Brownian motion and martingales. Optional sampling and convergence. Modeling of inventories, finance, flows in manufacturing and computer networks. Crosslisted with ISYE 6762.

MATH 6767. Design and Implementation of Systems to Support. 3 Credit Hours.
Computational Finance Introduction to large scale system design to support computational finance for options, stocks, or other financial instruments. Some programming experience, and previous exposure to stocks, bonds, and options required. Crosslisted with ISYE 6767.

MATH 6769. Fixed Income Securities. 3 Credit Hours.
Description, institutional features, and mathematical modeling of fixed income securities. Use of both deterministic and stochastic models. Crosslisted with ISYE 6769.

MATH 6783. Statistical Techniques of Financial Data Analysis. 3 Credit Hours.
Fundamentals of statistical inference for models used in the modern analysis of financial data. Crosslisted with ISYE 6783.

MATH 6785. The Practice of Quantitative and Computational Finance. 3 Credit Hours.
Case studies, visiting lecturers from financial institutions, student group projects of an advanced nature, and student reports, all centered around quantitative and computational finance. Crosslisted with ISYE and MGT 6785.

MATH 6793. Advanced Topics in Quantitative and Computational Finance. 3 Credit Hours.
Advanced foundational material and analysis techniques in quantitative and computational finance. Crosslisted with ISYE 6793.

MATH 6XXX. Mathematics Elective. 1-21 Credit Hours.

MATH 7000. Master's Thesis. 1-21 Credit Hours.

MATH 7012. Enumerative Combinatorics. 3 Credit Hours.
Fundamental methods of enumeration and asymptotic analysis, including the use of inclusion/exclusion, generating functions, and recurrence relations. Applications to strings over a finite alphabet and graphs.

MATH 7014. Advanced Graph Theory. 3 Credit Hours.
Advanced topics in graph theory. Selection of arguments varies every year.

MATH 7016. Combinatorics. 3 Credit Hours.
Fundamental combinatorial structures including hypergraphs, transversal sets, colorings, Sperner families, intersecting families, packings and coverings, perfect graphs, and Ramsey theory. Algebraic and topological methods, applications.

MATH 7018. Probabilistic Methods in Combinatorics. 3 Credit Hours.
Applications of probabilistic techniques in discrete mathematics, including classical ideas using expectation and variance as well as modern tools, such as martingale and correlation inequalities.

MATH 7244. Stochastic Processes and Stochastic Calculus I. 3 Credit Hours.
An introduction to the Ito stochastic calculus and stochastic differential equations through a development of continuous-time martingales and Markov processes. First of two courses.

MATH 7245. Stochastic Processes and Stochastic Calculus II. 3 Credit Hours.
An introduction to the Ito stochastic calculus and stochastic differential equations through a development of continuous-time martingales and Markov processes. Continuation of MATH 7244.

MATH 7251. High-dimensional probability. 3 Credit Hours.
The goal of this PhD level graduate course is to provide a rigorous introduction to the methods of high-dimensional probability.

MATH 7252. High-dimensional statistics. 3 Credit Hours.
The goal of this PhD level graduate course is to provide a rigorous introduction to the methods of high-dimensional statistics.

MATH 7337. Harmonic Analysis. 3 Credit Hours.
Fourier analysis on the torus and Euclidean space.

MATH 7338. Functional Analysis. 3 Credit Hours.
Spectral theory of bounded and unbounded operators, major theorems of functional analysis, additional topics.

MATH 7339. Advanced Analysis. 3 Credit Hours.
A comprehensive overview of advanced material in analysis. This is a Repeatable Course with 5 different subtitles; Recommended prerequisites may vary with each offering.

MATH 7510. Graph Algorithms. 3 Credit Hours.
Algorithms for graph problems such as maximum flow, covering, matching, coloring, planarity, minimum cuts, shortest paths, and connectivity. Crosslisted with ISYE 7510 and CS 7510.

MATH 7581. Calculus of Variations. 3 Credit Hours.
Minimization of functionals, Euler-Lagrange equations, sufficient conditions for a minimum; geodesic, isoperometric, and time of transit problems; variational principles of mechanics; applications to control theory.

MATH 7586. Tensor Analysis. 3 Credit Hours.
Review of linear algebra, multilinear algebra, algebra of tensors, co- and contravariant tensors, tensors in Riemann spaces, geometrical interpretation of skew tensors.

MATH 7999. Preparation for Doctoral Comprehensive Examination. 1-21 Credit Hours.

MATH 8305. Aural-Oral English Skills for Math ESL International Teaching Assistants. 2 Credit Hours.
Enhancement of English listening/speaking skills for SOM international graduate students, post-docs, and new faculty who speak English as their second language (ESL) and who will be teaching undergraduate students.

MATH 8306. Academic Communication for Intermediate ESL Math International Teaching Assistants. 2 Credit Hours.
Continued enhancement of English listening/speaking skills for current and future SOM graduate international teaching assistants and international lead instructors who speak English as their second language (ESL).

MATH 8307. Academic Communication for Advanced ESL Math International Teaching Assistants. 1 Credit Hour.
Continued enhancement of English listening/speaking skills for current and future SOM graduate international teaching assistants and international lead instructors who speak English as their second language (ESL).

MATH 8801. Special Topics. 1 Credit Hour.
This course enables the School of Mathematics to comply with requests for courses in selected topics.

MATH 8802. Special Topics. 2 Credit Hours.
This course enables the School of Mathematics to comply with requests for courses in selected topics.

MATH 8803. Special Topics. 3 Credit Hours.
This course enables the School of Mathematics to comply with requests for courses in selected topics.

MATH 8804. Special Topics. 4 Credit Hours.
This course enables the School of Mathematics to comply with requests for courses in selected topics.

MATH 8805. Special Topics. 5 Credit Hours.
This course enables the school of Mathematics to comply with requests for courses in selected topics.

MATH 8811. Special Topics. 1 Credit Hour.
This course enables the School of Mathematics to comply with requests for courses in selected topics.

MATH 8812. Special Topics. 2 Credit Hours.
This course enables the School of Mathematics to comply with requests for courses in selected topics.

MATH 8813. Special Topics. 3 Credit Hours.
This course enables the School of Mathematics to comply with requests for courses in selected topics.

MATH 8814. Special Topics. 4 Credit Hours.
This course enables the School of Mathematics to comply with requests for courses in selected topics.

MATH 8815. Special Topics. 5 Credit Hours.
This course enables the School of Mathematics to comply with requests for courses in selected topics.

MATH 8821. Special Topics. 1 Credit Hour.
This course enables the School of Mathematics to comply with requests for courses in selected topics.

MATH 8822. Special Topics. 2 Credit Hours.
This course enables the School of Mathematics to comply with requests for courses in selected topics.

MATH 8823. Special Topics. 3 Credit Hours.
This course enables the School of Mathematics to comply with requests for courses in selected topics.

MATH 8824. Special Topics. 4 Credit Hours.
This course enables the School of Mathematics to comply with requests for courses in selected topics.

MATH 8825. Special Topics. 5 Credit Hours.
This course enables the School of Mathematics to comply with requests for courses in selected topics.

MATH 8831. Special Topics. 1 Credit Hour.
This course enables the School of Mathematics to comply with requests for courses in selected topics.

MATH 8832. Special Topics. 2 Credit Hours.
This course enables the School of Mathematics to comply with requests for courses in selected topics.

MATH 8833. Special Topics. 3 Credit Hours.
This course enables the School of Mathematics to comply with requests for courses in selected topics.

MATH 8834. Special Topics. 4 Credit Hours.
This course enables the School of Mathematics to comply with requests for courses in selected topics.

MATH 8835. Special Topics. 5 Credit Hours.
This course enables the School of Mathematics to comply with requests for courses in selected topics.

MATH 8841. Special Topics. 1 Credit Hour.
This course enables the School of Mathematics to comply with requests for courses in selected topics.

MATH 8842. Special Topics. 2 Credit Hours.
This course enables the School of Mathematics to comply with requests for courses in selected topics.

MATH 8843. Special Topics. 3 Credit Hours.
This course enables the School of Mathematics to comply with requests for courses in selected topics.

MATH 8844. Special Topics. 4 Credit Hours.
This course enables the School of Mathematics to comply with requests for courses in selected topics.

MATH 8845. Special Topics. 5 Credit Hours.
This course enables the School of Mathematics to comply with requests for courses in selected topics.

MATH 8851. Special Topics. 1 Credit Hour.
This course enables the School of Mathematics to comply with requests for courses in selected topics.

MATH 8852. Special Topics. 2 Credit Hours.
This course enables the School of Mathematics to comply with requests for courses in selected topics.

MATH 8853. Special Topics. 3 Credit Hours.
This course enables the school of Mathematics to comply with requests for courses in selected topics.

MATH 8854. Special Topics. 4 Credit Hours.
This course enables the School of Mathematics to comply with requests for courses in selected topics.

MATH 8855. Special Topics. 5 Credit Hours.
This course enables the School of Mathematics to comply with requests for courses in selected topics.

MATH 8863. Advanced Topics in Graph Theory. 3 Credit Hours.
Selection of topics vary with each offering.

MATH 8873. Special Topics. 3 Credit Hours.
This course enables the school of Mathematics to comply with requests for courses in selected topics.

MATH 8900. Special Problems. 1-21 Credit Hours.

MATH 8901. Special Problems. 1-21 Credit Hours.

MATH 8902. Special Problems. 1-21 Credit Hours.

MATH 8903. Special Problems. 1-21 Credit Hours.

MATH 8997. Teaching Assistantship. 1-9 Credit Hours.
For students holding graduate teaching assistantships.

MATH 8998. Research Assistantship. 1-9 Credit Hours.
For students holding graduate research assistantships.

MATH 9000. Doctoral Thesis. 1-21 Credit Hours.

Mechanical Engineering (ME)

ME 1670. Introduction to Engineering Graphics and Design. 3 Credit Hours.
Introduction to engineering graphics and visualization including sketching, line drawing, and solid modeling. Development and interpretation of drawings and specifications for product realization.

ME 1801. Special Topics. 1 Credit Hour.
Special Topics.

ME 1XXX. Mechanical Engineering Elective. 1-21 Credit Hours.

ME 2016. Computer Applications. 3 Credit Hours.
An introduction to the use of computers and MATLAB programming for the solution of mechanical engineering problems. Topics include: sources of error in computing, the use of modular software design, basic numerical methods, and signal processing.

ME 2110. Creative Decisions and Design. 3 Credit Hours.
To learn fundamental techniques for creating, analyzing, synthesizing, and implementing design solutions to open- ended problems with flexibility, adaptability, and creativity through team and individual efforts.

ME 2202. Dynamics of Rigid Bodies. 3 Credit Hours.
Kinematics and dynamics of particles and rigid bodies in one, two, and three dimensions. Work-energy and impulse-momentum concepts.

ME 2202R. ME 2202 Recitation. 0 Credit Hours.
Recitation for ME 2022.

ME 2205. Three-dimensional rigid body dynamics. 1 Credit Hour.
Three-dimensional rigid body dynamics; Newton-Euler methods, inertia properties and principal axes; Euler equations, gyroscopic effects.

ME 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

ME 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

ME 2801. Special Topics. 1 Credit Hour.
Topics of current interest not offered in the regular course offerings.

ME 2803. Special Topics. 3 Credit Hours.
Topics of current interest not offered in the regular course offerings.

ME 2XXX. Mechanical Engineering Elective. 1-21 Credit Hours.

ME 3017. System Dynamics. 3 Credit Hours.
Dynamic modeling and simulation of systems with mechanical, hydraulic, thermal and/or electrical elements. Frequency response analysis, stability, and feedback control design of dynamic systems. Students cannot receive credit for ME 3017 and AE 3530.

ME 3017R. ME 3017 Recitation. 0 Credit Hours.
Recitation for ME 3017.

ME 3057. Experimental Methodology and Technical Writing. 3 Credit Hours.
Introduction to basic instrumentation and experimental methodology used in mechanical engineering, including calibration, use, precision and accuracy. Consideration errors, precision and accuracy in experimental measurements and technical reports.

ME 3141. Cutting-Edge Eng Seminar. 3 Credit Hours.
Seminar course on advanced engineering technologies directed to a non-technical audience. Distinguished guest speakers.

ME 3180. Machine Design. 3 Credit Hours.
The selection, analysis, and synthesis of springs, joining and fastening methods, bearings, shafts, gears, and other elements. Design of assemblies. Computer-based methods.

ME 3210. Design, Materials, and Manufacture. 3 Credit Hours.
Major manufacturing processes, capabilities, and costs. Interaction between design, materials and manufacturing process selection.

ME 3322. Thermodynamics. 3 Credit Hours.
Introduction to thermodynamics. Thermodynamic properties, energy and mass conservation, entropy and the second law. Second-law analysis of thermodynamic systems, gas cycles, vapor cycles.

ME 3322R. ME 3322 Recitation. 0 Credit Hours.
Recitation for ME 3322.

ME 3340. Fluid Mechanics. 3 Credit Hours.
The fundamentals of fluid mechanics. Topics include fluid statics; control-volume analysis; the Navier-Stokes equations; similitude; viscous, inviscid and turbulent flows; boundary layers.

ME 3340R. ME 3340 Recitation. 0 Credit Hours.
Recitation for ME 3340.

ME 3345. Heat Transfer. 3 Credit Hours.
Introduction to the study of heat transfer, transport coefficients, steady state conduction, transient conduction, radiative heat transfer, and forced and natural convection.

ME 3345R. ME 3345 Recitation. 0 Credit Hours.
Recitation for ME 3345.

ME 3700. Introduction to Energy Systems Engineering. 3 Credit Hours.
Renewable, fossil, and nulcear energy and its conversion into various forms. Electrical grid, energy storage, energy conservation, and mitigation of adverse conversion.

ME 3720. Introduction to Fluid and Thermal Engineering. 3 Credit Hours.
Theory and application, but no exhaustive treatment of fluid mechanics, thermodynamics, and heat transfer in analysis and design of fluid and thermal energy systems.

ME 3743. Analysis of Emerging Technologies. 3 Credit Hours.
Analysis of emerging technologies and their impacts for firm practice, market practice, policy, and society. Credit not allowed for both ME 3743 and MGT 3743 or CS 3743.

ME 3744. Managing Product, Service & Technology Development. 3 Credit Hours.
Analysis of the managerial challenges of the product development process. Credit not allowed for both ME 3744 and MGT 3744.

ME 3801. Special Topics. 1 Credit Hour.
Special Topics.

ME 3XXX. Mechanical Engineering Elective. 1-21 Credit Hours.

ME 4011. Internal Combustion Engines. 3 Credit Hours.
Analysis and design of various types of engines used in transportation systems. Topics include advances in energy efficiency and emissions in automotive applicatons.

ME 4012. Modeling and Control of Motion Systems. 3 Credit Hours.
Motion systems consisting of mechanical, fluid and electrical components are analyzed, modeled, and controlled. Alternatives are considered for system optimization.

ME 4013. Hybrid Vehicle Powertrains. 3 Credit Hours.
Course details fundamentals of hybrid vehicle powertrains, to include architectures (series, parallel, etc.), components, operation, control, modeling & simulation, and design fundamentals.

ME 4014. Introduction to Automotive Engineering. 3 Credit Hours.
Introduction to automotive engineering from a systems perspective. Major automotive systems and subsystems are described together with appropriate engineering models necessary for analysis and design.

ME 4042. Interactive Computer-Aided Design and Computer-Aided Engineering. 3 Credit Hours.
Principles of geometric modeling and finite-element method; interactive CAD and CAE software tools. CAD and CAE applications in thermal and mechanical design problems. Design projects.

ME 4056. Mechanical Engineering Systems Laboratory. 3 Credit Hours.
Measurement and analysis of mechanical, acoustic, manufacturing, thermodynamic, fluid, and heat transfer phenomena. Emphasis on data acquisition, reduction, analysis, and report preparation.

ME 4171. Environmentally Conscious Design and Manufacturing. 3 Credit Hours.
Including environmental considerations in engineering design; reducing environmental impact by design; recycling; material selection; de- and remanufacturing; life-cycle considerations, analyses, tradeoffs; ISO 14000.

ME 4172. Designing Sustainable Engineering Systems. 3 Credit Hours.
Understanding sustainability in context of market forces, availability of resources, technology, society. Methods for identifying, modeling, and selecting sustainable designs.

ME 4182. Mechanical Design Engineering. 3 Credit Hours.
Teams apply a systematic design process to real multidisciplinary problems. Problems selected from a broad spectrum of interest areas, including biomedical, ecological, environmental, mechanical, and thermal.

ME 4189. Mechanical Vibrations. 3 Credit Hours.
Single and multi-degree-of-freedom systems as well as continuous systems are analyzed for their vibrational response characteristics using both exact and approximate methods.

ME 4193. Design and Materials Selection for Tribological Applications. 3 Credit Hours.
Analysis of tribological aspects of machine components, including friction, lubrication, and wear. Group design project to optimize system tribological performance.

ME 4214. Mechanical Behavior of Materials. 3 Credit Hours.
Problems involving resistance of materials to plastic deformation, fracture, fatigue, and creep; mechanical testing; computer-based methods; case studies of failure.

ME 4215. Manufacturing Process Analysis. 3 Credit Hours.
First principles based modeling and analysis of manufacturing processes. Process design and optimization.

ME 4315. Energy Systems Analysis and Design. 3 Credit Hours.
Integrated concepts, laws, and methodologies from thermal sciences are used to analyze, model, and design energy systems and to predict system performance for fixed designs.

ME 4321. Refrigeration and Air Conditioning. 3 Credit Hours.
Application of thermodynamics principles to analysis and design of refrigeration and air conditioning systems, absorption and heat-driven systems, gas-vapor mixture psychrometrics, load estimates, delivery, and control.

ME 4324. Power Generation Technology. 3 Credit Hours.
Technology review and application of engineering sciences and economics to the analysis and design of power generation systems. Fossil, nuclear, and renewable energy systems are considered.

ME 4325. Introduction to Fuel Cell Systems. 3 Credit Hours.
Fuel cell systems are explained and analyzed, including single cells and stacks, and balance-of-plant fundamentals, with emphasis upon prevalent fuel cell types and their applications.

ME 4330. Heat and Mass Exchangers. 3 Credit Hours.
Heat transfer, fluid flow, and thermodynamics principles applied to the analysis and design of heat and mass exchangers, periodic regenerators, and cooling towers.

ME 4332. Renewable Energy Systems. 3 Credit Hours.
Renewable and efficient energy systems are introduced. Various energy conversion and storage technologies are explained and analyzed, along with their respective advantages and limitations.

ME 4340. Applied Fluid Mechanics. 3 Credit Hours.
Advanced study in three areas of fluid mechanics. Topics may be chosen from turbomachinery, flow measurement, compressible flow, applied aerodynamics, and others.

ME 4342. Computational Fluid Dynamics. 3 Credit Hours.
An introduction to computational fluid dynamics (CFD) in mechanical engineering. The theory and numerical techniques of CFD. Modern CFD software including grid generation and flow visualization tools will be used. Projects with complex fluid-flow systems.

ME 4405. Fundamentals of Mechatronics. 3 Credit Hours.
Focuses on fundamentals of microcontrollers, analog and digital electronics, sensors, actuators and their applications to modern mechatronics systems and intelligent manufacturing. Knowledge gained from lectures will be used to complete lab exercises. Credit will not be awarded for both ME 4405 and ME 6405 or ME 4405 and ME 4777.

ME 4451. Robotics. 3 Credit Hours.
Mathematical modeling, simulation, and control of robotic systems with mechanical and sensory elements.

ME 4452. Control of Dynamic Systems. 3 Credit Hours.
Modeling and simulation of dynamic systems in frequency and time domains. Feedback control analysis and design methods including root-locus, frequency response, and pole-placement. Introduction to digital control systems. Credit not allowed for both ME 4452 and ME 3015. Credit not allowed for both ME 4452 and AE 3531.

ME 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

ME 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

ME 4701. Wind Engineering. 3 Credit Hours.
An introductory course on wind energy and its potential; modeling and design of wind turbines; analysis of the economic benefits of wind turbine systems. Credit not allowed for both ME 4701 and AE 4701.

ME 4720. Pulp and Paper Manufacturing. 3 Credit Hours.
The course provides comprehensive foundational knowledge of the industry enabling the student to understand the role of diverse manufacturing operations and to strategically plan improvements. Cross-listed with ChBE 4720.

ME 4723. Interdisciplinary Capstone Design. 3 Credit Hours.
Seniors will work in teams to apply a systematic design process to real multi-disciplinary problems. Problems selected from a broad spectrum of interest areas, including biomedical, environmental, mechanical, industrial design, electrical and thermal/fluids. Projects must be based on the knowledge and skills acquired in earlier course work, and incorporate appropriate engineering standards and multiple realistic constraints. Emphasis is placed on the design process, the technical aspects of the design, and on reducing the proposed design to practice. The course consists of faculty and guest lectures, prototyping in design studios, and a multi-disciplinary design project.

ME 4725. Probabilistic Risk Assessment. 3 Credit Hours.
Introduction to a wide range of probabilistic risk analysis and probabilistic design methods for mechanical systems. Topics covered are probabilistic description, sampling methods, risk assessment, and reliability-based design.

ME 4730. Emerging Technologies for Forest Bioproducts. 3 Credit Hours.
The course provides comprehensive knowledge of the manufacture of nontraditional products from forest biomaterials. It analyzes and assesses emerging manufacturing technologies, materials and products. Cross-listed with ChBE 4730.

ME 4740. Biologically Inspired Design. 3 Credit Hours.
We examine evolutionary adaptation as a source for engineering design inspiration, utilizing principles of scaling, adaptability, and robust multifunctionality that characterize biological systems. Credit not allowed for both ME 4740 and (BIOL 4740, or ISYE 4740 or PTFE 4740 or MSE 4740).

ME 4741. Integrative Management Development - Project Preparation. 3 Credit Hours.
Individual and group-based experiential learning activities to develop integrated human system management skills that prepare students for more successful capstone collaboration and learning. Credit not allowed for both ME 4741 and CS 4741 or MGT 4741.

ME 4742. Integrated Technology and Management Capstone Project. 4 Credit Hours.
Project-based course where students in the Technology and Management Program will work in inter-disciplinary teams on projects provided by corporate affiliates. Credit not allowed for both ME 4742 and CS 4742 or MGT 4742.

ME 4744. Global Development Capstone. 3 Credit Hours.
Teams develop solutions to multidisciplinary problems selected from globalization, food security, infrastructure, health, water, sanitation, hygiene, ecosystem resilience, services, capacity building, and urbanization.

ME 4753. Topics in Engineering Practice. 3 Credit Hours.
Topics of current inportance offered in collaboration with an approved partner of Georgia Tech's Distance Learning Program.

ME 4754. Electronics Packaging Assembly, Reliability, Thermal Management, and Test. 3 Credit Hours.
The course provides hands-on instruction in electronics packaging, including assembly, reliability, thermal management, and test of next-generation microsystems. Crosslisted with ECE and MSE 4754.

ME 4757. Biofluid Mechanics. 3 Credit Hours.
Introduction to the study of blood flow in the cardiovascular system. Emphasis on modeling and the potential of flow studies for clinical research application. Crosslisted with AE and CHE 4757.

ME 4758. Biosolid Mechanics. 3 Credit Hours.
The mechanics of living tissue, e.g., arteries, skin, heart muscle, ligament, tendon, cartilage, and bone. Constitutive equations and some simple mechanical models. Mechanics of cells. Applications. Crosslisted with AE and CHE 4758.

ME 4759. Electrochemical Energy Storage and Conversion. 3 Credit Hours.
An elective class for senior-level students interested in electrochemical storage and conversion, including the fundamentals of electrochemistry and practical battery and fuel cells. Cross-listed with ChBE and MSE 4759.

ME 4760. Engineering Acoustics and Noise Control. 3 Credit Hours.
Study of acoustics related to noise and its control; acoustic terminology, wave propagation, wave equation solutions, instrumentation, data processing, room acoustics, noise control, hearing, noise legislation. Crosslisted with AE 4760.

ME 4766. Fabrication and Properties of Nanoscale Devices. 3 Credit Hours.
Fundamental properties at the nanoscale for photonics and sensors. Nanoscale fabrication methods including thin films, ion beam, lithography, electroplating, and example case studies in NEMS/MEMS and photonics. Credit not allowed for both ME 4766 and MSE 4766.

ME 4767. Pulp and Paper Lab. 3 Credit Hours.
The course offers the fundamentals of pulp and paper testing procedures. Cross-listed with ChBE 4767.

ME 4775. Polymer Science and Engineering I: Formation and Properties. 3 Credit Hours.
An introduction to the chemistry, structure and formation of polymers, physical states and transitions, physical and mechanical properties of polymer fluids and solids. Crosslisted with CHEM, CHE, MSE, and PTFE 4775.

ME 4776. Polymer Science and Engineering II: Analysis, Processing, and Laboratory. 3 Credit Hours.
Polymer fabrication processes and methods of characterization and identification of polymers are presented. Experiments in polymerization, processing, and property evaluation of polymers. Crosslisted with CHE, CHEM, MSE, and TFE 4776.

ME 4777. Introduction to Polymer Science and Engineering. 3 Credit Hours.
An introduction to the structure and formation of polymers, physical states and transitions, physical and mechanical properties of polymer fluids and solids, and processing of polymers. Crosslisted with MSE and PTFE 4777.

ME 4781. Biomedical Instrumentation. 3 Credit Hours.
A study of medical instrumentation from a systems viewpoint. Pertinent physiological and electro-physiological concepts will be covered. Credit not allowed for both ME 4781 and (CHE 4781 or CHBE 4781 or BMED 4781 or ECE 4781).

ME 4782. Biosystems Analysis. 3 Credit Hours.
Analytical methods for modeling biological systems, including white-noise protocols for characterizing nonlinear systems. Crosslisted with BMED, CHE and ECE 4782.

ME 4790. Materials Selection and Design. 3 Credit Hours.
Principles of selecting materials and processes for engineering applications. Methodologies for designing new materials and conceiving hybrid solutions. Credit not allowed for both ME 4790 and ME 4213 or ME 4790.

ME 4791. Mechanical Behavior of Composites. 3 Credit Hours.
Stress-strain behavior of composites, properties of matrix and reinforcing materials, mechanics of fiber-reinforced composites, lamina and laminate analysis, and mechanical performance. Crosslisted with AE, CEE, CHE, MSE, and PTFE 4791.

ME 4793. Composite Materials and Processes. 3 Credit Hours.
Basic principles of selection and design of composite materials and their manufacturing and testing. Cost factors. Laboratory exercises on manufacturing and tests. Crosslisted with AE, CEE, CHE, ME, MSE, and PTFE 4793.

ME 4795. Fundamental Elements of Nuclear Reactor Materials. 3 Credit Hours.
Introduction to fundamentals of nuclear reactor materials. Topics covered are basics of radiation damage, defect creation and evolution, microstructure-property correlations in cladding and fuel of nuclear materials.

ME 4801. Special Topics in Mechanical Engineering. 1 Credit Hour.
Special topic offerings of current interest not included in regular courses.

ME 4802. Special Topics in Mechanical Engineering. 2 Credit Hours.
Special topic offerings of current interest not included in regular courses.

ME 4803. Special Topics in Mechanical Engineering. 3 Credit Hours.
Special topic offerings of current interest not included in regular courses.

ME 4804. Special Topics in Mechanical Engineering. 4 Credit Hours.
Special topic offerings of current interest not included in regular courses.

ME 4805. Special Topics in Mechanical Engineering. 5 Credit Hours.
Special topic offerings of current interest not included in regular courses.

ME 4811. Special Topics. 1 Credit Hour.

ME 4812. Special Topics. 2 Credit Hours.

ME 4813. Special Topics. 3 Credit Hours.

ME 4814. Special Topics. 4 Credit Hours.

ME 4815. Special Topics. 5 Credit Hours.

ME 4821. Special Topics. 1 Credit Hour.

ME 4822. Special Topics. 2 Credit Hours.

ME 4823. Special Topics. 3 Credit Hours.

ME 4824. Special Topics. 4 Credit Hours.

ME 4825. Special Topics. 5 Credit Hours.

ME 4831. Special Topics. 1 Credit Hour.

ME 4832. Special Topics. 2 Credit Hours.

ME 4833. Special Topics. 3 Credit Hours.

ME 4834. Special Topics. 4 Credit Hours.

ME 4835. Special Topics. 5 Credit Hours.

ME 4843. Special Topics- ME Lab. 3 Credit Hours.
ME Special Topics with lab component.

ME 4853. Special Topics. 3 Credit Hours.
ME Special Topics with lab component.

ME 4863. Special Topics. 3 Credit Hours.
Special Topics in Mechanical Engineering.

ME 4873. Special Topics. 3 Credit Hours.

ME 4901. Special Problems in Mechanical Engineering. 1-21 Credit Hours.
Individual studies in certain specialized areas, and mathematical analyses and/or experimental investigations of problems of current interest in mechanical engineering.

ME 4902. Special Problems. 1-21 Credit Hours.
Individual studies in certain specialized areas, and mathematical analyses and/or experimental investigations of problems of current interest in mechanical engineering.

ME 4903. Special Problems. 1-21 Credit Hours.
Individual studies in certain specialized areas, and mathematical analyses and/or experimental investigations of problems of current interest in mechanical engineering.

ME 4XXX. Mechanical Engineering Elective. 1-21 Credit Hours.

ME 6007. Interfacial Fluid Mechanics. 3 Credit Hours.
The mechanics of fluid interfaces. Mathematical techniques of scaling and calculus of curved surfaces towards analysis of menisci, bubbles, jets, films, foams, and coatings.

ME 6101. Engineering Design. 3 Credit Hours.
Design concepts, processes, and methodologies, including quality and robustness. Group project.

ME 6102. Designing Open Engineering Systems. 3 Credit Hours.
Decision-based integrated product and process development, meta-design, and decision support problems; mathematical modeling of decisions involving ambiguity and uncertainty; critical thinking and analysis; verification and validation; research issues.

ME 6103. Optimization in Engineering Design. 3 Credit Hours.
Use of single and multi-objective optimization in modeling and solving mechanical engineering design problems. Formulations, solution algorithms, validation and verification, computer implementation. Project.

ME 6104. Computer-Aided Design. 3 Credit Hours.
Fundamentals of CAD, including geometric and solid modeling, parametric representations, features, and human-machine interactions. Applications to design, analysis, and manufacturing.

ME 6105. Modeling and Simulation in Design. 3 Credit Hours.
Modeling and simutaltion concepts, algorithms, and methods; modeling of energy-based and discrete-event systems; modeling of design decisions; information modeling and knowledge representation; project.

ME 6124. Finite-Element Method: Theory and Practice. 3 Credit Hours.
Line, plane, solid, plate, and shell elements-theory: practical aspects of modeling; applications in mechanical engineering; final project.

ME 6201. Principles of Continuum Mechanics. 3 Credit Hours.
Introductory treatment of the fundamental, unifying concepts of the mechanics of continua.

ME 6203. Inelastic Deformation of Solids. 3 Credit Hours.
Phenomenological aspects of nonlinear material behavior and deformation with emphasis on model development.

ME 6204. Micromechanics of Materials. 3 Credit Hours.
Fundamental concepts of micromechanics of solids with emphasis on application to composite materials.

ME 6222. Manufacturing Processes and Systems. 3 Credit Hours.
Materials processing analysis and selection. Manufacturing systems design. Economic analysis.

ME 6223. Automated Manufacturing Process Planning. 3 Credit Hours.
Fundamentals of process planning. Automated process planning approaches and algorithms. Geometric modeling for process planning. Modeling and analysis of flexible fixturing systems. Mechanical assembly planning.

ME 6224. Machine Tool Analysis and Control. 3 Credit Hours.
Mechanics and dynamics of machining, machine tool components and structures, sensors and control of machine tools, machine process planning and optimization.

ME 6225. Metrology and Measurement Systems. 3 Credit Hours.
Metrology techniques and procedures. Precision manufacturing system design and analysis.

ME 6229. Introduction to Micro-Electro-Mechanical Systems. 3 Credit Hours.
Principles of microfabrication for sensors and actuators. Lumped parameter analysis and computer-aided design; materials properties; case studies include cantilever beam, pressure sensor, and accelerometer.

ME 6242. Mechanics of Contact. 3 Credit Hours.
Mechanics of surface contact, with emphasis on tribological interactions as in rolling element bearings, slider bearings, mechanical seals, and materials processing.

ME 6243. Fluid Film Lubrication. 3 Credit Hours.
Analytical and numerical investigation of full film compressible and incompressible hydrodynamic lubrication problems for steady and unsteady conditions.

ME 6244. Rotordynamics. 3 Credit Hours.
Analysis and design of shafts for rotating machinery. Torsional vibration, synchronous and nonsynchronous whirl, stability, gyroscopic effects, hydrodynamic bearings, hysteresis, squeeze film dampers, and balancing.

ME 6281. Mechanics of Paper Forming and Coating. 3 Credit Hours.
Fundamentals of multiphase flow in paper forming and coating processes, and its impact on the physical properties of composite fiber structure and surface characteristics.

ME 6300. Intermediate Heat Transfer. 3 Credit Hours.
Intermediate topics including multidimensional transient conduction, diffusion, boundary layers, internal flows, radiation, phase change, heat exchangers, multimode transfer, and numerical methods with a project-oriented approach.

ME 6301. Conduction Heat Transfer. 3 Credit Hours.
Steady and transient one- and multi-dimensional conduction. Emphasis on analytical methods, numerical techniques, and approximate solutions.

ME 6302. Convection Heat Transfer. 3 Credit Hours.
Convection (forced and free) in laminar and turbulent, internal and external flows. Analogy between momentum and heat transfer. Scaling laws and modeling.

ME 6303. Thermal Radiation Heat Transfer. 3 Credit Hours.
Fundamentals of thermal radiation, blackbody radiation, surface characteristics, exchange in enclosures, radiation through continua, and combined mode heat transfer.

ME 6304. Principles of Thermodynamics. 3 Credit Hours.
Fundamentals of thermodynamics including energy, entropy, and energy analysis, property relations, equilibrium conditions, and evaluation of properties.

ME 6305. Applications of Thermodynamics. 3 Credit Hours.
Applications of the first and second laws of thermodynamics to analysis and design optimization of power and refrigeration systems incorporating heat exchangers and combustion processes.

ME 6309. Nanoscale Heat Transfer. 3 Credit Hours.
Microscopic concepts and methodology in thermal science, including equilibrium statistics. Boltzmann transport equation, and nano-microscale heat conduction and radiation, with applications in contemporary technologies.

ME 6335. NUMERICAL HEAT TRANSFER. 3 Credit Hours.
This course will provide foundation to develop numerical solutions for steady state and transient thermal transport problems in complex geometries.

ME 6401. Linear Control Systems. 3 Credit Hours.
Theory and applications of linear systems, state space, stability, feedback controls, observers, LQR, LQG, Kalman filters. Credit will not be awarded for both ME 6401 and AE 6530.

ME 6402. Nonlinear Control Systems. 3 Credit Hours.
Analysis of nonlinear systems, geometric control, variable structure control, adaptive control, optimal control, applications.

ME 6403. Digital Control Systems. 3 Credit Hours.
Comprehensive treatment of the representation, analysis, and design of discrete-time systems. Techniques include Z- and W- transforms, direct method, control design, and digital tracking.

ME 6404. Advanced Control System Design and Implementation. 3 Credit Hours.
Analysis, synthesis, and implementation techniques of continuous-time and real-time control systems using classical and state-space methods.

ME 6405. Introduction to Mechatronics. 3 Credit Hours.
Modeling and control of actuators and electro-mechanical systems. Performance and application of microprocessors and analog electronics to modern mechatronic systems.

ME 6406. Machine Vision. 3 Credit Hours.
Design of algorithms for vision systems for manufacturing, farming, construction, and the service industries. Image processing, optics, illumination, feature representation.

ME 6407. Robotics. 3 Credit Hours.
Analysis and design of robotic systems including arms and vehicles. Kinematics and dynamics. Algorithms for describing, planning, commanding, and controlling motion force.

ME 6408. Advanced Mechatronics. 3 Credit Hours.
Focusing on team projects, designing and building intelligent machines and products. Lectures - sensors and transducers, actuators, fluid power, power rectifiers, motion control and modeling of mechatronics systems.

ME 6409. Biomechatronics of Wearable Robotic Devices. 3 Credit Hours.
An introduction to the emerging science of human-machine interaction with particular focus on wearable robotic devices for restoration or augmentation of human movement.

ME 6441. Dynamics of Mechanical Systems. 3 Credit Hours.
Motion analysis and dynamics modeling of systems of particles and rigid bodies in three-dimensional motion.

ME 6442. Vibration of Mechanical Systems. 3 Credit Hours.
Introduction to modeling and oscillatory response analysis for discrete continuous mechanical and structural systems.

ME 6443. Variational Methods in Engineering. 3 Credit Hours.
Calculus of variations, Hamilton's principle and Lagrange's equations, Sturm-Liouville problems, approximation techniques.

ME 6444. Nonlinear Systems. 3 Credit Hours.
Investigation of nonlinear systems using analytical and numerical techniques.

ME 6449. Acoustic Transducers and Signal Analysis. 3 Credit Hours.
Acoustic instrumentation and methods of signal analysis.

ME 6452. Wave Propagation in Solids. 3 Credit Hours.
Wave motion in solids, wave equations, analytical and numerical solutions, ultrasonic NDE.

ME 6460. Microelectromechanical Devices. 3 Credit Hours.
Introduces fundamental concepts and tools needed for the design, simulation and analysis of MEMS devices. These include electrical, mechanical, radiant, thermal, magnetic and chemical domains.

ME 6601. Introduction to Fluid Mechanics. 3 Credit Hours.
The fundamentals of fluid mechanics. Derivation of the governing equations of motion. An introduction to viscous, inviscid, turbulent, and boundary-layer flows.

ME 6602. Viscous Flow. 3 Credit Hours.
The mechanics of Newtonian viscous fluids. The use of modern analytical techniques to obtain solutions for flows with small and large Reynolds numbers.

ME 6607. Interfacial Fluid Mechanics. 3 Credit Hours.
The mechanics of fluid interfaces. Mathematical techniques of scaling and calculus of curved surfaces towards analysis of menisci,bubbles, jets, films, foams, and coatings.

ME 6622. Experimental Methods. 3 Credit Hours.
Experimental methods in mechanics. Includes measurement techniques, instrumentation, data acquisition, signal processing, and linear and digital electronics.

ME 6701. Wind Engineering. 3 Credit Hours.
An introductory course on wind energy and its potential; modeling and design of wind turbines; analysis of the economic benefits of wind turbine systems. Credit will not be awarded for both ME 6701 and AE 6701.

ME 6705. Introduction to Mechatronics. 4 Credit Hours.
Modeling and control of actuators and electro-mechanical systems. Performance and application of microprocessors and analog electronics to modern mechatronic systems.

ME 6720. Biotransport. 3 Credit Hours.
This graduate level course covers the analysis of fluid flow phenomena in the human body, cardiovasculature, respiratory system and other organ systems. Credit will not be awarded for both ME 6720 and BMED 6720.

ME 6741. Pulp and Paper Manufacture I. 3 Credit Hours.
The fundamentals of pulp and paper technology are presented. Applications to the several unit operations used are explored and augmented by field trips and recent case studies. Crosslisted with CHE 6741, CHBE 6701 and MLDR 6701.

ME 6743. Biosolid Mechanics. 3 Credit Hours.
Structure-function relationships and constitutive models for a variety of biological tissues, with an emphasis on understanding the mechanical behaviors of normal and pathological tissues. Credit not give for both ME/BMED 6783 and ME/BMED 6743. Crosslisted with BMED 6743.

ME 6744. Topics in Engineering Practice. 3 Credit Hours.
Topics of current importance offered in collaboration with an approved partner of Georiga Tech's Distance Learning Program. Crosslisted with ECE 6744.

ME 6746. Rehabilitation Engineering. 3 Credit Hours.
Students will participate in rehabilitation engineering as practiced in the assistive technology industry. Credit not allowed for both ME 6746 and APPH 6746.

ME 6753. Principles of Management for Engineers. 3 Credit Hours.
The course will provide an introduction to selected topics needed to be successful in the technology industries. Cannot count toward major area requirements on M.S. or Ph.D. programs of study. Crosslisted with MGT 6753.

ME 6760. Acoustics I and II. 3 Credit Hours.
Fundamental principles governing the generation, propagation, reflection, and transmission of sound waves in fluids. Crosslisted with AE 6760.

ME 6761. Acoustics I and II. 3 Credit Hours.
Radiation and scattering of sound waves in fluids, duct acoustics, dissipation phenomena. Crosslisted with AE 6761.

ME 6762. Applied Acoustics. 3 Credit Hours.
Mufflers, resonators, acoustic materials, barriers, industrial noise, room acoustics, active noise control. Crosslisted with AE 6762.

ME 6765. Kinetics and Thermodynamics of Gases. 4 Credit Hours.
Thermodynamics of nonreacting and reacting gas mixtures. Introductory quantum theory, statistical thermodynamics, and gas kinetic theory. Crosslisted with AE 6765.

ME 6766. Combustion I. 3 Credit Hours.
Introductory chemical kinetics, deformations and deflagrations, laminar flame propagation in premixed gases, ignition and quenching, laminar diffusion flames, droplet burning, and turbulent reacting flows. Crosslisted with AE 6766.

ME 6768. Polymer Structure, Physical Properties, and Characterization. 3 Credit Hours.
Formulations and analysis of molecular and phenomenological models of elastic and viscoelastic behavior, development and description of structure, and fundamental aspects of structure-property relations. Crosslisted with CHE, MSE, and PTFE 6768.

ME 6769. Linear Elasticity. 3 Credit Hours.
Governing equations of linear elasticity, plane elasticity, boundary-value problems, airy stress function and complex variable methods, simple three-dimensional solutions. Crosslisted with AE 6769.

ME 6770. Energy and Variational Methods in Elasticity and Plasticity. 3 Credit Hours.
Applications in energy and variational methods in engineering mechanics to elastic, plastic, and dynamical behavior of deformable media. Crosslisted with AE 6770.

ME 6776. Integrated Low-cost Microelectronics Systems Packaging. 3 Credit Hours.
Broad overview of system-level, cross-disciplinary microelectronics packaging technologies, including design, test, thermal, reliability, optoelectronics, and RF integration. Comparison of system-on-chip and system-on-package. Crosslisted with ECE and MSE 6776.

ME 6777. Advanced Biomaterials. 3 Credit Hours.
Advanced topics of biomaterials performance and engineering, including biointerfaces, host reactions to materials, and bio-inspired/smart-materials strategies. Crosslisted with BMED, CHE, and MSE 6777.

ME 6779. Thermal Engineering for Packaging of Micro and Nano Systems. 3 Credit Hours.
Passive, active, and hybrid thermal management techniques, and computational modeling of micro systems. Air cooling, single phase and phase change liquid cooling, heat pipes, and thermoelectrics. Crosslisted with ECE 6779.

ME 6782. Cellular Engineering. 3 Credit Hours.
Engineering analysis of cellular systems. Crosslisted with BMED and CHE 6782.

ME 6789. Technology Ventures. 3 Credit Hours.
Team discussion and case studies of issues in biomedical engineering technology transfer including licensing, financial capital, safety and efficacy studies, clinical trials, and strategic planning. Crosslisted with BMED, ECE, CHE, and MGT 6789.

ME 6792. Computer Integrated Manufacturing Systems Seminar. 1 Credit Hour.
Guest speakers on a broad range of manufacturing-related topics: research, applications, and technology. Required for Certificate in Manufacturing. Crosslisted with ECE and ISYE 6792.

ME 6793. Systems Pathophysiology. 3 Credit Hours.
Overview of human pathophysiology from a quantitative perspective. Emphasis on systems of interest to bioengineering faculty. Introduction to quantitative models for biological systems. Crosslisted with BMED, CHE, and ECE 6793.

ME 6794. Tissue Engineering. 3 Credit Hours.
Biological, engineering, and medical issues in developing tissue-engineered constructs. Emphasis in the integration of these disciplines at a basic molecular and cell biology level. Crosslisted with BMED and CHE 6794.

ME 6795. Mathematical, Statistical, and Computational Techniques in Materials Science. 3 Credit Hours.
Emphasizes the fundamental physical, analytical, and mathematical techniques commonly encountered in materials engineering including stress and strain, crystallographic and orientation transformations, X-ray, TEM, and solid-state concepts. Crosslisted with MSE and PTFE 6795.

ME 6796. Structure-Property Relationships in Materials. 3 Credit Hours.
Introduction to the multi-scale structure effects on material properties. For MSE students, this course will prepare students for future in-depth courses. For non-MSE students, the course will provide a background in materials and may serve as part of the program of study for a minor in materials. Crosslisted with MSE and PTFE 6796.

ME 6797. Thermodynamics and Kinetics of Microstructural Evolution. 3 Credit Hours.
The reduction of chemical-free energy, strain energy, and interfacial energy controls the kinetics of diffusional transformations. These factors are explored from the point of view of processing and stability of the microstructure during service. Crosslisted with MSE and PTFE 6797.

ME 6799. Legal Issues in Technology Transfer. 3 Credit Hours.
Study and analysis of U.S. law as it applies to the patenting and licensing processes. Crosslisted with CHE, MGT, and BMED 6799.

ME 6XXX. Mechanical Engineering Elective. 1-21 Credit Hours.

ME 7000. Master's Thesis. 1-21 Credit Hours.

ME 7056. GT-STUTTGART. 12 Credit Hours.
Placeholder for GT-STUTTGART students.

ME 7057. GT-SEOUL. 12 Credit Hours.
Placeholder for GT-SEOUL students.

ME 7201. Computational Mechanics of Materials. 3 Credit Hours.
Computational treatments of material and geometric nonlinearity, with emphasis on rate-dependent elasto-plasticity and fracture.

ME 7203. Advanced Constitutive Relations for Solids. 3 Credit Hours.
Advanced treatment of constitutive laws for nonlinear behavior of solids. Coupled thermomechanical laws and underlying physical and thermodynamical bases. Behavior of media with underlying substructure.

ME 7205. Mechanics and Applications of Nanostructured Materials and Devices. 3 Credit Hours.
Introduction to mechanics and transport processes of discrete atomistic and molecular systems, fabrication of nanodevices/structures and applications to nanoelectronics, tribology, actuation and sensors.

ME 7227. Additive Manufacturing and Rapid Prototyping. 3 Credit Hours.
Rapid prototyping technologies in engineering design. Physical principles, materials, materials processing. Laboratory demonstrations and project.

ME 7301. Transport Phenomena in Multiphase Flow. 3 Credit Hours.
Gas-liquid, two-phase flow patterns, basic and empirical models; conservation equations and closure relations; pool and convective boiling; aerosol transport; condensation.

ME 7442. Vibration of Continuous Systems. 3 Credit Hours.
Equations of motion and oscillatory response of dynamic systems modeled as continuous media.

ME 7602. Hydrodynamic Stability. 3 Credit Hours.
Hydrodynamic stability of fluid flows using linear, energy, and nonlinear stability theories. Taylor-Couette, buoyancy- driven, surface-tension-driven, shear, and thin-film flows.

ME 7741. Robotics Professional Preparation. 1 Credit Hour.
Preparation for a professional career in Robotics. Local & visiting speakers. Program introduction. Technical resume preparation. GT Robotics labs & resources.

ME 7742. Robotics Professional Preparation 2. 1 Credit Hour.
Preparation for a professional career in Robotics. Local & visiting speakers. Selecting and applying for Internship. Developing capstone project proposal. Public speaking practice and preparation.

ME 7743. Robotics Professional Preparation 3. 1 Credit Hour.
Preparation for a professional career in Robotics. Local & visiting speakers. Interview preparation & career search. Technical report writing and presentation.

ME 7751. Computational Fluid Mechanics. 3 Credit Hours.
Numerical methods for solving the time-dependent Navier-Stokes equations in complex geometrics, including theory, implementation, and applications. Crosslisted with CEE 7751.

ME 7757. Teaching Practicum. 3 Credit Hours.
Supervised teaching for doctoral students. Teaching techniques, course and curriculum design, student evaluation methods and criteria. Students may, in some instances, prepare and present lectures. Crosslisted with NRE, HP, and CHBE 7757.

ME 7764. Acoustic Propagation. 3 Credit Hours.
Propagation of sound in inhomogeneous fluids; ray acoustics, ocean and atmospheric acoustics, nonlinear acoustics. Crosslisted with AE 7764.

ME 7771. Mechanics of Polymer Solids and Fluids. 3 Credit Hours.
Continuum mechanics of solids and fluids; mechanics of deformation of anisotropic polymers; yield, breaking, and fatigue; non-Newtonian viscous and viscoelastic behavior of polymer fluids. Crosslisted with CHE, MSE, and PTFE 7771.

ME 7772. Fundamentals of Fracture Mechanics. 3 Credit Hours.
Advanced study of failure of structural materials under load, mechanics of fracture, and microscopic and macroscopic aspects of the fracture of engineering materials. Crosslisted with AE, CEE, CHE, and MSE 7772.

ME 7773. Advanced Fracture Mechanics. 3 Credit Hours.
Nonlinear fracture mechanics including elastic-plastic and time-dependent fracture, advanced test methods, J-integral theory, and extensions. Crosslisted with AE, CEE, CHE, and MSE 7773.

ME 7774. Fatigue of Materials and Structures. 3 Credit Hours.
Mechanical and microstructural aspects of nucleation and growth of cracks under cyclic loading conditions, notch effects, cumulative damage, multiaxial loading, and fatigue crack propagation. Crosslisted with AE, CEE, CHE, and MSE 7774.

ME 7775. Topics in Fracture and Fatigue of Metallic and Composite Structures. 3 Credit Hours.
Brittle and ductile failure criteria. Failure prediction in composite structures. Free-edge and internal delamination. Anisotropic cracks. Fatigue behavior of composites and comparison with metal fatigue. Crosslisted with AE, CHE, and MSE 7775.

ME 7785. Introduction to Robotics Research. 3 Credit Hours.
Familiarizes students with the core areas of robotics; mechanics, control, perception, AI, and autonomy. Provides an introduction to the mathematical tools required in robotics research.

ME 7793. Manufacturing of Composites. 3 Credit Hours.
Major manufacturing techniques of metal-ceramic and polymer-matrix composites. Modeling of processes with emphasis on fundamental mechanisms and effects. Crosslisted with AE, CEE, CHE, MSE, and PTFE 7793.

ME 8001. Master Seminar I. 1 Credit Hour.
Seminars for MSME students. Credit not allowed for both ME 8001 and ECE 8001.

ME 8002. Master Seminar II. 1 Credit Hour.
Seminars for MSME students. Credit not allowed for both ME 8002 and ECE 8001.

ME 8010. Seminars in Mechanical Engineering. 1 Credit Hour.
Seminars involving current research projects presented by graduate students, faculty, and invited speakers.

ME 8011. Seminars in Mechanical Engineering. 1 Credit Hour.
Seminars involving current research projects presented by graduate students, faculty, and invited speakers.

ME 8012. Seminars in Mechanical Engineering. 1 Credit Hour.
Seminars involving current research projects presented by graduate students, faculty, and invited speakers.

ME 8014. Seminars in Mechanical Engineering. 2 Credit Hours.
Seminars involving current research projects presented by graduate students, faculty, and invited speakers.

ME 8740. Robotics Internship. 1-21 Credit Hours.
Graduate Internship at a partner company, GTRI or a GT Robotics lab.

ME 8741. Robotics Capstone Project. 3 Credit Hours.
Teams or individuals apply the knowledge and skills acquired throughout the MS program to a faculty supervised robotics project.

ME 8750. Robotics Research Foundation I. 3 Credit Hours.
Multidisciplinary research course supervised by two robotics faculty from different schools participating in the robotics Ph.D. program.

ME 8751. Robotics Research Foundation II. 3 Credit Hours.
Continuation of ME 8751 (Robotics Research Foundation I).

ME 8801. Special Topics in Manufacturing. 1 Credit Hour.
Special topic offerings of current interest in manufacturing not included in regular courses.

ME 8802. Special Topics in Manufacturing. 2 Credit Hours.
Special topic offerings of current interest in manufacturing not included in regular courses.

ME 8803. Special Topics in Manufacturing. 3 Credit Hours.
Special topic offerings of current interest in manufacturing not included in regular courses.

ME 8804. Special Topics in Manufacturing. 4 Credit Hours.
Special topic offerings of current interest in manufacturing not included in regular courses.

ME 8805. Special Topics in Manufacturing. 5 Credit Hours.
Special topic offerings of current interest in manufacturing not included in regular courses.

ME 8806. Special Topics in Manufacturing. 6 Credit Hours.
Special topic offerings of current interest in manufacturing not included in regular courses.

ME 8811. Special Topics in Computer-aided Engineering and Design. 1 Credit Hour.
Special topic offerings of current interest in computer-aided engineering not included in regular courses.

ME 8812. Special Topics in Computer-aided Engineering and Design. 2 Credit Hours.
Special topic offerings of current interest in computer-aided engineering not included in regular courses.

ME 8813. Special Topics in Computer-aided Engineering and Design. 3 Credit Hours.
Special topic offerings of current interest in computer-aided engineering not included in regular courses.

ME 8814. Special Topics in Computer-aided Engineering and Design. 4 Credit Hours.
Special topics offerings of current interest in computer-aided engineering not included in regular courses.

ME 8815. Special Topics in Computer-aided Engineering and Design. 5 Credit Hours.
Special topics offerings of current interest in computer-aided engineering not included in regular courses.

ME 8816. Special Topics in Computer-aided Engineering and Design. 6 Credit Hours.
Special topics offerings of current interest in computer-aided engineering not included in regular courses.

ME 8821. Special Topics in Tribology. 1 Credit Hour.
Special topic offerings of current interest in tribology not included in regular courses.

ME 8822. Special Topics in Tribology. 2 Credit Hours.
Special topic offerings of current interest in tribology not included in regular courses.

ME 8823. Special Topics in Tribology. 3 Credit Hours.
Special topics offerings of current interest in tribology not included in regular courses.

ME 8824. Special Topics in Tribology. 4 Credit Hours.
Special topics offerings of current interest in tribology not included in regular courses.

ME 8825. Special Topics in Tribology. 5 Credit Hours.
Special topic offerings of current interest in tribology not included in regular courses.

ME 8826. Special Topics in Tribology. 6 Credit Hours.
Special topic offerings of current interest in tribology not included in regular courses.

ME 8831. Special Topics in Thermal Sciences. 1 Credit Hour.
Special topics offerings of current interest in thermal sciences not included in regular courses.

ME 8832. Special Topics in Thermal Sciences. 2 Credit Hours.
Special topics offerings of current interest in thermal sciences not included in regular courses.

ME 8833. Special Topics in Thermal Sciences. 3 Credit Hours.
Special topic offerings of current interest in thermal sciences not included in regular courses.

ME 8834. Special Topics in Thermal Sciences. 4 Credit Hours.
Special topic offerings of current interest in thermal sciences not included in regular courses.

ME 8835. Special Topics in Thermal Sciences. 5 Credit Hours.
Special topic offerings of current interest in thermal sciences not included in regular courses.

ME 8836. Special Topics in Thermal Sciences. 6 Credit Hours.
Special topics offerings of current interest in thermal sciences not included in regular courses,

ME 8841. Special Topics in Automation and Mechatronics. 1 Credit Hour.
Special topic offerings of current interest in automation and mechatronics not included in regular courses.

ME 8842. Special Topics in Automation and Mechatronics. 2 Credit Hours.
Special topic offerings of current interest in automation and mechatronics not included in regular courses.

ME 8843. Special Topics in Automation and Mechatronics. 3 Credit Hours.
Special topic offerings of current interest in automation and mechatronics not included in regular courses.

ME 8844. Special Topics in Automation and Mechatronics. 4 Credit Hours.
Special topic offerings of current interest in automation and mechatronics not included in regular courses.

ME 8845. Special Topics in Automation and Mechatronics. 5 Credit Hours.
Special topic offerings of current interest in automation and mechatronics not included in regular courses.

ME 8846. Special Topics in Automation and Mechatronics. 6 Credit Hours.
Special topic offerings of current interest in automation and mechatronics not included in regular courses.

ME 8851. Special Topics in Acoustics and Dynamics. 1 Credit Hour.
Special topic offerings of current interest in acoustics and dynamics not included in regular courses.

ME 8852. Special Topics in Acoustics and Dynamics. 2 Credit Hours.
Special topic offerings of current interest in acoustics and dynamics not included in regular courses.

ME 8853. Special Topics in Acoustics and Dynamics. 3 Credit Hours.
Special topic offerings of current interest in acoustics and dynamics not included in regular courses.

ME 8854. Special Topics in Acoustics and Dynamics. 4 Credit Hours.
Special topic offerings of current interest in acoustics and dynamics not included in regular courses.

ME 8855. Special Topics in Acoustics and Dynamics. 5 Credit Hours.
Special topic offerings of current interest in acoustics and dynamics not included in regular courses.

ME 8856. Special Topics in Acoustics and Dynamics. 6 Credit Hours.
Special topic offerings of current interest in acoustics and dynamics not included in regular courses.

ME 8861. Special Topics in Fluid Mechanics. 1 Credit Hour.
Special topic offerings of current interest in fluid mechanics not included in regular courses.

ME 8862. Special Topics in Fluid Mechanics. 2 Credit Hours.
Special topic offerings of current interest in fluid mechanics not included in regular courses.

ME 8863. Special Topics in Fluid Mechanics. 3 Credit Hours.
Special topic offerings of current interest in fluid mechanics not included in regular courses.

ME 8864. Special Topics in Fluid Mechanics. 4 Credit Hours.
Special topic offerings of current interest in fluid mechanics not included in regular courses.

ME 8865. Special Topics in Fluid Mechanics. 5 Credit Hours.
Special topic offerings of current interest in fluid mechanics not included in regular courses.

ME 8866. Special Topics in Fluid Mechanics. 6 Credit Hours.
Special topic offerings of current interest in fluid mechanics not included in regular courses.

ME 8871. Special Topics in Bioengineering. 1 Credit Hour.
Special topic offerings of current interest in bioengineering not included in regular courses.

ME 8872. Special Topics in Bioengineering. 2 Credit Hours.
Special topic offerings of current interest in bioengineering not included in regular courses.

ME 8873. Special Topics in Bioengineering. 3 Credit Hours.
Special topic offerings of current interest in bioengineering not included in regular courses.

ME 8874. Special Topics in Bioengineering. 4 Credit Hours.
Special topic offerings of current interest in bioengineering not included in regular courses.

ME 8875. Special Topics in Bioengineering. 5 Credit Hours.
Special topic offerings of current interest in bioengineering not included in regular courses.

ME 8876. Special Topics in Bioengineering. 6 Credit Hours.
Special topic offerings of current interest in bioengineering not included in regular courses.

ME 8881. Special Topics in Mechanics of Materials. 1 Credit Hour.
Special topic offerings of current interest in mechanics of materials not included in regular courses.

ME 8882. Special Topics in Mechanics of Materials. 2 Credit Hours.
Special topic offerings of current interest in mechanics of materials not included in regular courses.

ME 8883. Special Topics in Mechanics of Materials. 3 Credit Hours.
Special topic offerings of current interest in mechanics of materials not included in regular courses.

ME 8884. Special Topics in Mechanics of Materials. 4 Credit Hours.
Special topic offerings of current interest in mechanics of materials not included in regular courses.

ME 8885. Special Topics in Mechanics of Materials. 5 Credit Hours.
Special topic offerings of current interest in mechanics of materials not included in regular courses.

ME 8886. Special Topics in Mechanics of Materials. 6 Credit Hours.
Special topic offerings of current interest in mechanics of materials not included in regular courses.

ME 8893. Special Topics. 3 Credit Hours.
Special Topics.

ME 8894. Special Topics. 4 Credit Hours.
Special Topics.

ME 8901. Special Problems in Manufacturing. 1-21 Credit Hours.
Individual studies and/or experimental investigation of problems of current interest in manufacturing.

ME 8902. Special Problem in Manufacturing. 1-21 Credit Hours.
Individual studies and/or experimental investigation of problems of current interest in manufacturing.

ME 8903. Special Problems in Manufacturing. 1-21 Credit Hours.
Individual studies and/or experimental investigation of problems of current interest in manufacturing.

ME 8904. Special Problems in Manufacturing. 1-21 Credit Hours.
Individual studies and/or experimental investigation of problems of current interest in manufacturing.

ME 8905. Special Problems in Manufacturing. 1-21 Credit Hours.
Individual studies and/or experimental investigation of problems of current interest in manufacturing.

ME 8906. Special Problems in Manufacturing. 1-21 Credit Hours.
Individual studies and/or experimental investigation of problems of current interest in manufacturing.

ME 8911. Special Problems in Computer-aided Engineering and Design. 1-21 Credit Hours.
Individual studies and/or experimental investigation of problems of current interest in computer-aided engineering and design.

ME 8912. Special Problems in Computer-aided Engineering and Design. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in computer-aided engineering and design.

ME 8913. Special Problems in Computer-aided Engineering and Design. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in computer-aided engineering and design.

ME 8914. Special Problems in Computer-aided Engineering and Design. 1-21 Credit Hours.
Individual studies and/or experimental investigation of problems of current interest in computer-aided engineering and design.

ME 8915. Special Problems in Computer-aided Engineering and Design. 1-21 Credit Hours.
Individual studies and/or experimental investigation of problems of current interest in computer-aided engineering and design.

ME 8916. Special Problems in Computer-aided Engineering and Design. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in computer-aided engineering and design.

ME 8921. Special Problems in Tribology. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in tribology.

ME 8922. Special Problems in Tribology. 1-21 Credit Hours.
Individual studies and/or experimental investigation of problems of current interest in tribology.

ME 8923. Special Problems in Tribology. 1-21 Credit Hours.
Individual studies and/or experimental investigation of problems of current interest in tribology.

ME 8924. Special Problems in Tribology. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in tribology.

ME 8925. Special Problems in Tribology. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in tribology.

ME 8926. Special Problems in Tribology. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in tribology.

ME 8931. Special Problems in Thermal Sciences. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in thermal sciences.

ME 8932. Special Problems in Thermal Sciences. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in thermal sciences.

ME 8933. Special Problems in Thermal Sciences. 1-21 Credit Hours.
Individual studies and/or experimental investigation of problems of current interest in thermal sciences.

ME 8934. Special Problems in Thermal Sciences. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in thermal sciences.

ME 8935. Special Problems in Thermal Sciences. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in thermal sciences.

ME 8936. Special Problems in Thermal Sciences. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in thermal sciences.

ME 8941. Special Problems in Automation and Mechatronics. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in automation and mechatronics.

ME 8942. Special Problems in Automation and Mechatronics. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in automation and mechatronics.

ME 8943. Special Problems in Automation and Mechatronics. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in automation and mechatronics.

ME 8944. Special Problems in Automation and Mechatronics. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in automation and mechatronics.

ME 8945. Special Problems in Automation and Mechatronics. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in automation and mechatronics.

ME 8946. Special Problems in Automation and Mechatronics. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in automation and mechatronics.

ME 8951. Special Problems in Acoustics and Dynamics. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in acoustics and dynamics.

ME 8952. Special Problems in Acoustics and Dynamics. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in acoustics and dynamics.

ME 8953. Special Problems in Acoustic and Dynamics. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in acoustics and dynamics.

ME 8954. Special Problems in Acoustics and Dynamics. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in acoustics and dynamics.

ME 8955. Special Problems in Acoustics and Dynamics. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in acoustics and dynamics.

ME 8956. Special Problems in Acoustics and Dynamics. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in acoustics and dynamics.

ME 8961. Special Problems in Fluid Mechanics. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in fluid mechanics.

ME 8962. Special Problems in Fluid Mechanics. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in fluid mechanics.

ME 8963. Special Problems in Fluid Mechanics. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in fluid mechanics.

ME 8964. Special Problems in Fluid Mechanics. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in fluid mechanics.

ME 8965. Special Problems in Fluid Mechanics. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in fluid mechanics.

ME 8966. Special Problems in Fluid Mechanics. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in fluid mechanics.

ME 8971. Special Problems in Bioengineering. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in bioengineering.

ME 8972. Special Problems in Bioengineering. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in bioengineering.

ME 8973. Special Problems in Bioengineering. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in bioengineering.

ME 8974. Special Problems in Bioengineering. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in bioengineering.

ME 8975. Special Problems in Bioengineering. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in bioengineering.

ME 8976. Special Problems in Bioengineering. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in bioengineering.

ME 8981. Special Problems in Mechanics of Materials. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in the mechanics of materials.

ME 8982. Special Problems in Mechanics of Materials. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in mechanics of materials.

ME 8983. Special Problems in Mechanics of Materials. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in mechanics of materials.

ME 8984. Special Problems in Mechanics of Materials. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in the mechanics of materials.

ME 8985. Special Problems in Mechanics of Materials. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in the mechanics of materials.

ME 8986. Special Problems in Mechanics of Materials. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in the mechanics of materials.

ME 8997. Teaching Assistantship. 1-9 Credit Hours.
For graduate students holding graduate teaching assistantships.

ME 8998. Research Assistantship. 1-9 Credit Hours.
For graduate students holding graduate research assistantships.

ME 9000. Doctoral Thesis. 1-21 Credit Hours.

Management (MGT)

MGT 1XXX. Management Elective. 1-21 Credit Hours.

MGT 2106. Legal, Social, Ethical Aspects of Business. 3 Credit Hours.
Development and function of the law, court organization, procedure, and substantive law in contracts, business organizations, and agencies. Also exposes social responsibility and ethics in business.

MGT 2210. Information Systems and Digital Transformation. 3 Credit Hours.
How information and information systems support business operations, decision-making, and differentiation, and transform organizations and industries. Hands-on experience with current tools for working with data.

MGT 2250. Management Statistics. 3 Credit Hours.
This is the introduction to basic statistics for management students.

MGT 2255. Quantitative Analysis for Business. 3 Credit Hours.
This course focuses on the problem-solving and decision-making processes that use quantitative management science concepts and techniques. Credit will not be awarded for both MGT 2255 and MGT 2251.

MGT 2598. Management Internship. 1-12 Credit Hours.
Recognition for a paid, full or part time, employment experience that is relevant to a student's management education.

MGT 2599. Internship and Independent Study. 1-3 Credit Hours.
Independent study conducted for one student under the guidance of a faculty member in association with an unpaid internship.

MGT 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

MGT 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

MGT 2803. Special Topics. 3 Credit Hours.
Permits a group of students and a professor to pursue areas of management not extensively treated in any other course.

MGT 2910. Special Problems. 1-3 Credit Hours.
Independent study conducted for one student under the guidance of a faculty member.

MGT 2911. Special Problems. 1-3 Credit Hours.
Independent study conducted for one student under the guidance of a faculty member.

MGT 2912. Special Problems. 1-3 Credit Hours.
Independent study conducted for one student under the guidance of a faculty member.

MGT 2XXX. Management Elective. 1-21 Credit Hours.

MGT 3000. Financial and Managerial Accounting. 3 Credit Hours.
A foundation course in measuring and reporting the financial performance and status of the firm as well as basic concepts in cost and managerial accounting. No credit allowed for MGT majors. No credit allowed for MGT 3000 and ACCT 2101. Credit not allowed for MGT 3000 and ACCT 2102.

MGT 3062. Financial Management. 3 Credit Hours.
An introduction to finance. Topics include: time value of money, capital budgeting, risk and return, capital structure, dividend policy, and working capital management. No credit allowed for MGT 3062 and MGT 3078.

MGT 3075. Security Valuation. 3 Credit Hours.
The valuation of securities using fundamental and technical analysis. Topics include: DCF valuation, price multiples, free cash flow, and the construction of quantitative trading models.

MGT 3076. Investments. 3 Credit Hours.
Introduction to the securities markets and a study of the theory and practice of security analysis and portfolio management as applied to stocks and bonds.

MGT 3078. Finance and Investments. 3 Credit Hours.
An introduction to finance and to the securities markets. Topics include: time value of money, risk and return, capital budgeting, security analysis and portfolio management of stocks, bonds, and derivatives. No credit allowed for MGT majors. Credit not allowed for MGT 3078 and MGT 3062.

MGT 3079. Management of Financial Institutions. 3 Credit Hours.
Introduction to the various risks faced by financial institutions and a detailed analysis of the tools used to manage these risks.

MGT 3082. Fundamentals of Real Estate Development. 3 Credit Hours.
An overview of the real estate development process from concept through design, feasibility, financing, construction, marketing, management and ultimate sale or long term financing.

MGT 3084. Derivative Securities. 3 Credit Hours.
An introduction to options, futures, and swaps is provided. Concepts of arbitrage, index trading, and portfolio insurance are discussed.

MGT 3101. Organizational Behavior. 3 Credit Hours.
Introduction to how the behavior of individuals, groups, and organizations affects organizational effectiveness. Credit not allowed for both MGT 3101 and 3150.

MGT 3102. Managing Human Resources within a Regulatory Environment. 3 Credit Hours.
Analysis of various frameworks for understanding the social regulatory environments of human resources management and how they influence management decision making.

MGT 3103. Leadership in a Changing Environment. 3 Credit Hours.
The course focuses on the leadership challenges posed by recent changes in the business environment, and on the skills needed to adapt to those changes.

MGT 3118. Cross-cultural Management. 3 Credit Hours.
This course develops students' global awareness to better understand and cope with the issues and challenges that managers face when working across international boundaries.

MGT 3150. Principles of Management. 3 Credit Hours.
Course explores functions of management; planning, organizing, staffing, leading, and controlling. Lectures, case studies, and business exercises are used to reinforce principles that are taught. Credit not allowed for both MGT 3150 and MGT 3101.

MGT 3300. Marketing Management I. 3 Credit Hours.
The course presents and develops the primary marketing variables that are used in designing an overall marketing program. A systems approach is taken with the variables managed to optimize overall results.

MGT 3310. Marketing Research: Analytics. 3 Credit Hours.
This course covers the fundamentals of the analytical aspects of marketing research. The course has an applied orientation with application to contemporary issues in marketing.

MGT 3312. Pricing Strategy and Analytics. 3 Credit Hours.
The course introduces the conceptual underpinnings of the price setting process and discusses ways to leverage modern marketing analytic tools/methods to improve pricing decisions.

MGT 3313. Social Media Marketing. 3 Credit Hours.
Explores the use of social media marketing as a fundamental marketing channel for driving customer engagement, brand advocacy, and enhanced customer loyalty.

MGT 3325. Product Planning. 3 Credit Hours.
Overviews issues inherent in product development and product management. These include product strategy, idea generation, market development, product positioning, test marketing, launch, and brand management.

MGT 3501. Operations Management. 3 Credit Hours.
This course focuses on the issues and techniques relevant to the management of the operations function within an organization, emphasizing its strategic significance.

MGT 3510. Management of Technology. 3 Credit Hours.
Focus on managing the design, assessment, and implementation-change strategy of a firm's manufacturing and information-based technological capabilities to improve competitive performance.

MGT 3599. Career Development Workshop. 1 Credit Hour.
This workshop style class focuses on skills and strategies for identifying a career path and conducting a successful job search in the field of management.

MGT 3605. Principles of Commerical Law. 3 Credit Hours.
Course offers an in-depth examination of contracts, negotiable instruments and creditor/debtor issues, all essential for making informed decisions in commercial and financial business environments.

MGT 3606. International Business Law. 3 Credit Hours.
International Business Law focuses on the legal environment of international trade and private commercial transactions.

MGT 3607. Business Ethics. 3 Credit Hours.
This courses introduces students to ethical aspects of the business decision-making process, including: theoretical underpinnings of ethics, stakeholders, and decision-making strategies.

MGT 3608. Technology Law and Ethics. 3 Credit Hours.
This class will examine some of the ethical, legal, and social issues associated with computers, information systems, and public and private networks including the Internet.

MGT 3609. Legal Aspects of Real Estate. 3 Credit Hours.
Legal Aspects of Real Estate introduces students to legal considerations in real estate, including ownership, sale transactions, leasing, title insurance, financing, zoning and environmental laws.

MGT 3614. Law for Entrepreneurs. 3 Credit Hours.
This course will focus on legal issues which entrepreneurs face while growing a start-up business from infancy to a publicly held company.

MGT 3616. Corporate Governance. 3 Credit Hours.
This course focuses on the U.S. corporate governance model examining the governance and management of business organizations, including board of director and officer responsibility.

MGT 3659. Foundations of Strategy. 3 Credit Hours.
This course covers the basic concepts and frameworks of strategy analysis and strategy formulation. Credit will not be awarded for both MGT 3659 and MGT 4195.

MGT 3660. International Business. 3 Credit Hours.
Examines the position of the U.S. in world markets, various types of international business transactions, and the relationship of business to global economic, political-legal and cultural forces.

MGT 3661. Advanced Concepts in International Business. 3 Credit Hours.
Covers significant aspects of international business with a particular focus on the challenges associated with transnational corporations.

MGT 3662. Management in the Healthcare Sector. 3 Credit Hours.
An exploration of the healthcare sector in its most comprehensive sense, analyzing the healthcare "system" and resulting management issues.

MGT 3663. Technology Strategy. 3 Credit Hours.
Provides an understanding of economic and strategic factors that guide firms' strategic decisions regarding the generation, commercialization, protection, and adoption of the technological innovations.

MGT 3664. Corporate Strategy. 3 Credit Hours.
Provides frameworks and case studies to understand how companies create value across different businesses.

MGT 3742. Spreadsheet Modeling for Business Decision Support. 3 Credit Hours.
Using advanced spreadsheet capabilities, macros, and add-ons to create decision support systems for business applications. Not an introductory course.

MGT 3743. Analysis of Emerging Technologies. 3 Credit Hours.
Analysis of emerging technologies and their impacts for firm practice, market practice, policy, and society. Credit not allowed for both MGT 3743 and ME 3743 or CS 3743.

MGT 3744. Managing Product, Service & Technology Development. 3 Credit Hours.
Analysis of the managerial challenges of the product development process. Credit not allowed for both MGT 3744 and ME 3744/CS 3744.

MGT 3745. Business Programming. 3 Credit Hours.
An introduction to the basic concepts and skills of software programming and their applications to solving business problems.

MGT 3770. Business Decisions for Sustainability and Shared Value. 3 Credit Hours.
The WEF Global Risks Report and UN SDGs are used as frameworks to explore the role of basic human needs in shaping long-term business value.

MGT 3XXX. Management Elective. 1-21 Credit Hours.

MGT 4010. Business Taxation. 3 Credit Hours.
Comprehensive survey of federal taxation of business. A focus on tax planning and decision making will extend to the study of the tax code and regulations.

MGT 4015. Advanced Managerial Accounting. 3 Credit Hours.
The course will examine current issues in managerial accounting.

MGT 4026. Financial Reporting and Analysis I. 3 Credit Hours.
Intermediate-level treatment of revenue recognition, inventories, contracts, interest capitalization, property and equipment, intangibles, long-term liabilities, and shareholder's equity. Significant emphasis on financial analysis.

MGT 4027. Financial Reporting and Analysis II. 3 Credit Hours.
Advanced topics including tax reporting, leases, pensions, foreign currency transactions, hedging, statement translation, and business combinations and consolidations. Significant emphasis in financial analysis.

MGT 4028. Financial Analysis and Reporting of Technology Firms. 3 Credit Hours.
An in-depth look at reporting standards for and the financial characteristics of technology firms, with an emphasis on the financial analysis of such firms.

MGT 4030. International Accounting. 3 Credit Hours.
An overview of accounting issues arising from the increased internationalization of business. Topics include comparative financial reporting among countries and accounting treatments of international transactions.

MGT 4041. Auditing and Financial Control Systems. 3 Credit Hours.
This course covers professional issues surrounding auditing and financial control systems. Topics include management fraud, legal liability, audit evidence, etc.

MGT 4043. Advanced Financial Reporting. 3 Credit Hours.
Financial reporting and accounting for: mergers and acquisitions; consolidated financial statements; international transactions and hedges of exchange-rate fluctuations; partnerships; and governmental and not-for-profit organizations. Credit not allowed for both MGT 4043 and MGT 6043.

MGT 4045. Seminar in Advanced Accounting. 3 Credit Hours.
An intensive treatment of a selection of contemporary accounting topics. Topical coverage may span subject matter ranging across the fields of auditing, systems, managerial and tax accounting.

MGT 4046. Applications of Data Analytics in Accounting. 3 Credit Hours.
Students will learn to apply advanced analytical techniques in business settings to facilitate better decision making, with a particular focus on financial and managerial reporting.

MGT 4047. Ethics & Accounting. 3 Credit Hours.
The course is designed to expose students to issues surrounding accountants' professional ethics. Credit not allowed for both MGT 4047 and MGT 6047.

MGT 4050. Business Analytics. 3 Credit Hours.
This course teaches the process of transforming data into business insights. It covers the methodologies, algorithms, issues, and challenges related to analyzing business data.

MGT 4051. Decision Support and Expert Systems. 3 Credit Hours.
This course discusses the basic features of decision support systems and expert systems. It covers the development tools and business applications.

MGT 4052. Systems Analysis and Design. 3 Credit Hours.
An introductory course on the development life cycle of business information systems. It covers analysis and design tools and methodology. Credit not allowed for both MGT 4052 and CS 4052.

MGT 4053. Business Data Communications. 3 Credit Hours.
Introductory data communication concepts. Data communication applications in organizations. Overview of data communication products and services available from a technology consumer perspective.

MGT 4055. International Issues in Information Technology Management. 3 Credit Hours.
An overview of international issues in the Information Technology Management (ITM) area. Topics include: offshore software development, transborder data flow restrictions, and global connectivity issues.

MGT 4056. Electronic Commerce. 3 Credit Hours.
This course examines the business and technical issues related to electronic commerce applications, such as the Internet, WWW, EDI, and electronic linkages between trading partners.

MGT 4057. Business Process Analysis and Design. 3 Credit Hours.
Business processes are the mechanisms by which work is organized and performed. This course covers the analysis of business processes and efficient redesign through technology. Credit will not be awarded for both CS 4057 and MGT 4057.

MGT 4058. Database Management Systems. 3 Credit Hours.
An introductory course on databases providing hands-on experience with a DBMS. Topics include data modeling, relational database design, and SQL.

MGT 4066. Corporate Restructuring. 3 Credit Hours.
This course examines the finance, economics, law, and business strategies that underlie major corporate restructuring transactions. Topics include valuation, acquisitions, divestitures, and high-leveraged transactions.

MGT 4067. Financial Markets: Trading and Structure. 3 Credit Hours.
The course focuses on liquidity, market structure and trading. Attention is given to the efficiency of trading systems and the role of intermediaries on market structure issues.

MGT 4068. Fixed Income. 3 Credit Hours.
This course covers the important securites that trade in the fixed income market and the valuation models that are used to price them.

MGT 4070. International Finance. 3 Credit Hours.
Financial management in an international setting. Topics include: foreign exchange markets, exchange risk management, international portfolio investment, and foreign direct investment.

MGT 4071. Multinational Financial Management. 3 Credit Hours.
This course emphasizes decision making for the multimedia firm amidst exchange rate fluctuations, differing tax structures across countries, and political risk via lectures, case-discussion and analysis, and project-based learning.

MGT 4072. Entrepreneurial Finance. 3 Credit Hours.
This course has been developed to expand the student's understanding and knowledge of the financial aspects of starting, funding, operating, and/or exiting an entrepreneurial venture. Credit not allowed for both MGT 4072 and MGT 6086.

MGT 4073. Financial Modeling. 3 Credit Hours.
This course presents tools necessary to build advanced Excel spreadsheets for financial decision-making. The course will include topics such as firm valuation, financial statements, cost of capital, portfolio construction, option valuation, duration and immunization.

MGT 4102. Management Consulting. 3 Credit Hours.
This course explores being a Management Consultant, and will introduce students to consulting frameworks and methods; simulate consulting activities and situations using cases.

MGT 4116. The Role of Gender, Race and Ethnicity in Organizational Behavior. 3 Credit Hours.
This course will examine how managers and employees become more effective leaders by understanding the role gender, race and ethnicity plays in the life of the organization. Credit not allowed for both MGT 4116 and MGT 6116.

MGT 4117. Global Workforce Management. 3 Credit Hours.
This course examines how an organization deploys and manages a global workforce while considering cultural and economic differences across the world.

MGT 4119. Leading Teams in Organizations. 3 Credit Hours.
This course prepares students to be an effective leaders and managers of teams by giving students frameworks to implement and diagnose effective team processes.

MGT 4181. Business Forecasting. 3 Credit Hours.
The course covers statistical tools to forecast using the past behavior of data. Topics include moving average and autoregressive models, trends, cycles and volatility.

MGT 4189. Social Impact: In-depth Exploration & Design. 3 Credit Hours.
This is a project-based course that is focused on system-level exploration of social issues and provides opportunities for leadership development and working in teams.

MGT 4190. Strategic Quality Management and Competitiveness. 3 Credit Hours.
This course examines the philosophy and techniques of strategic quality management (e.g. cycle time mgt., learning organizations, quality control) as means to promote individual productivity and improve organizational competitiveness.

MGT 4191. The Entrepreneurship Forum. 3 Credit Hours.
This course provides an understanding of the entrepreneurial process, explores the role of the entrepreneur, and identifies the critical issues in starting ventures and working in entrepreneurial organizations.

MGT 4192. Impact Speaker Series Forum. 3 Credit Hours.
With the a speaker series as an integral component, the class explores the competencies and aspects of making an impact. Through speakers, articles and case studies it presents examples for review and insights.

MGT 4193. Servant Leadership, Values & Systems. 3 Credit Hours.
An exploration of the nature and integration of inidividual and organizational values, systemic thinking, and the concept of servant leadership. Learning occurs through case studies, simulations, readings, personal reflection and team activities.

MGT 4194. Social Enterprise and Entrepreneurship. 3 Credit Hours.
Social Entrepreneurship applies innovative solutions to the world's pressing social problems by having students utilize leadership and managerial skills to address major challenges.

MGT 4196. Strategy Consulting Practicum. 3 Credit Hours.
Provides experiential learning in strategy processes of analysis, design, and execution. Emphasis on issues currently confronted by major corporations.

MGT 4220. Integrative Management Experience. 3 Credit Hours.
Provides understanding of strategy implementation and the integration of different functional areas of the firm using lectures, cases, and a Capstone simulation. Credit will not be awared for both MGT 4220 and MGT 4195.

MGT 4303. Personal Selling and Sales Management. 3 Credit Hours.
Students will obtain an understanding of the management of the sales function. The importance of the marketing-sales interface will be stressed.

MGT 4304. Strategic Brand Management. 3 Credit Hours.
This course teaches undergraduate students about the importance of brands, and makes them knowledgeable about, and able to apply instruments to create, monitor, and manage brands.

MGT 4305. Business-to-Business Marketing. 3 Credit Hours.
This course studies the marketing of products and services for resale, for use in producing other goods and services, and for the operations of an enterprise.

MGT 4307. Strategic Marketing. 3 Credit Hours.
Students will obtain an understanding of strategic marketing development and alternatives. Analysis and implementation through functional marketing strategies will be stressed.

MGT 4308. Advertising & Promotion: Integrated Marketing Communications. 3 Credit Hours.
This course is designed to focus on the primary marketing of communication through advertising and promotion implemented with an integrated approach. Strategic and tactical dimensions are covered for both traditional media such as broadcast, print, out-of-home and direct, as well as new media including the internet, mobile, and other trends in the industry.

MGT 4309. Services Marketing. 3 Credit Hours.
Explores how many of the traditional marketing models can be adapted to the marketing of services, as well as introducing entirely new concepts and frameworks specifically applicable to services and services marketing.

MGT 4311. Digital Marketing. 3 Credit Hours.
This course explores the various components of the digital channel including social, mobile, and search engine marketing to understand how to implement an effective digital marketing strategy.

MGT 4314. Understanding Markets with Data Science. 3 Credit Hours.
This course applies a data science approach using network and text analytics to model and analyze how individuals and various kinds of markets behave.

MGT 4331. Consumer Behavior. 3 Credit Hours.
An applied course that provides a basic understanding of the behavioral science concepts to explain the behavior of consumers in the marketplace.

MGT 4332. Database and CRM Strategy. 3 Credit Hours.
Provides an understanding of analytic techniques and computer models in analyzing customer-centric data and developing customer relationship (CRM) strategy.

MGT 4335. International Marketing. 3 Credit Hours.
Students will obtain an understanding of marketing across national borders and cultures. The differences and similarities throughout the marketing functions are explored.

MGT 4341. Management of Healthcare Operations. 3 Credit Hours.
Explore the roles of operations management practices and health information technologies in addressing the challenges in the healthcare enterprise and harnessing opportunities for transforming it.

MGT 4345. Marketing Consulting Practicum. 3 Credit Hours.
This project based course provides practical experience addressing strategic marketing opportunities and helps develop high value skills for critically analyzing problems and providing tractable solutions.

MGT 4352. Operations Resource Planning and Execution. 3 Credit Hours.
The management of material flows within an enterprise will be covered by tracking the evolution of operational planning and execution systems through the enterprise resource planning (ERP) framework.

MGT 4353. Operations Strategy. 3 Credit Hours.
This course provides knowledge about developing, implementing and evaluating operations strategy. It stresses the relationships between the operations and other functions of the organization.

MGT 4360. Global Operations and Supply Chain Management. 3 Credit Hours.
This course is designed to present issues critical to the globalization of operations, and addresses strategic and tactical issues pertaining to an organization's global operations and supply chain activities.

MGT 4365. Quality Control and Improvement. 3 Credit Hours.
This course focuses on statistical process control, acceptance sampling, robust design, and other general methodologies for quality improvement.

MGT 4366. Service Operations Management. 3 Credit Hours.
This course analyzes operational performance for the service and for service-support functions of manufacturers. Industries include information services, health care, parking, transportation, distribution, and retail.

MGT 4367. Revenue Analytics. 3 Credit Hours.
This course examines how an organization deploys and manages model and data driven pricing techniques to maximize revenues.

MGT 4369. Sustainable Business Consulting Practicum. 3 Credit Hours.
Learn consulting skills and apply these to a sustainability issue for a client organization. Instructors and coaches offer expertise in corporate sustainability and management consulting.

MGT 4370. Managing Process Innovation. 3 Credit Hours.
Course focuses on tools and techniques to improve and innovate a process. Also explored is presenting data and results for maximum impact.

MGT 4401. Supply Chain Modeling. 3 Credit Hours.
The objective of this course is to provide students with tools and models for matching supply and demand in the most cost effective way.

MGT 4450. Project Management. 3 Credit Hours.
Concepts, techniques, and tools from the project management body of knowledge covering initiating, planning, controlling, executing, and closing projects. Includes agile techniques and certification preparation. Credit will not be awarded for both MGT 4450 and MGT 6450.

MGT 4598. Management Internship. 1-12 Credit Hours.
Recognition for a paid, full or part time, employment experience that is relevant to a student's management education.

MGT 4599. Internship and Independent Study. 1-3 Credit Hours.
Independent study conducted for one student under the guidance of a faculty member in association with an unpaid internship.

MGT 4610. Law, Management, and Economics. 3 Credit Hours.
Interrelationships among law, economics, and management. Focuses on the legal and economic aspects of management decisions.

MGT 4611. Integrative Management Analysis. 3 Credit Hours.
Integrates the functional areas of management, economics, and the external environment in which businesses operate. The course is designed to broaden the student's perspective on management.

MGT 4655. Business Data Preparation and Visualization. 3 Credit Hours.
Introduction to data preparation and visualization principles and tools for exploration, explanation, and critique of data for research and decision support in a business context.

MGT 4670. Entrepreneurship. 3 Credit Hours.
Provides students with an understanding of the process of establishing a technology-based venture. Students learn how to evaluate market opportunities, conduct feasibility studies, create venture teams, and write business plans.

MGT 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

MGT 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

MGT 4725. Information Security Strategies and Policy. 3 Credit Hours.
Information security vulnerabilities and risks; legal, cost, privacy, and technology constraints; derivation of strategies; technical and procedural means of achieving desired ends. Credit will not be awarded for both MGT 4725 and MGT 6725 or CS 6725 or CS 4725 or PUBP 4725 or PUBP 6725.

MGT 4726. Privacy, Technology, Policy, and Law. 3 Credit Hours.
This course takes a multi-disciplinary approach to privacy, a topic of great interest in the technology, policy, ethics, law, and business realms. Credit will not be awarded for both MGT 4726 and MGT 6726 or CS 4726 or CS 6726 or PUBP 4726 or PUBP 6726.

MGT 4741. Integrative Management Development-Project Preparation. 3 Credit Hours.
Individual and group-based experiential learning activities to develop integrated human system management skills that prepare students for more successful capstone collaboration and learning. Credit not allowed for both MGT 4741 and CS 4741 or ME 4741.

MGT 4742. Integrated Technology and Management Capstone Project. 4 Credit Hours.
Project-based course where students in the Technology and Management Program will work in inter-disciplinary teams on projects provided by corporate affiliates. Credit not allowed for both MGT 4742 and CS 4742 or ME 4742.

MGT 4803. Special Topics in Management. 3 Credit Hours.
Permits a group of students and a professor to pursue areas of management not extensively treated in any other course.

MGT 4811. Special Topics in Management. 1 Credit Hour.
Permits a group of students and a professor to pursue areas of management not extensively treated in other courses.

MGT 4812. Special Topics in Management. 2 Credit Hours.
Permits a group of students and a professor to pursue areas of management not extensively treated in other courses.

MGT 4813. Special Topics in Management. 3 Credit Hours.
Permits a group of students and a professor to pursue areas of management not extensively treated in other courses.

MGT 4814. Special Topics in Management. 4 Credit Hours.
Permits a group of students and a professor to pursue areas of management not extensively treated in other courses.

MGT 4815. Special Topics in Management. 5 Credit Hours.
Permits a group of students and a professor to pursue areas of management not extensively treated in other courses.

MGT 4823. Special Topics. 3 Credit Hours.
Permits a group of students and a professor to pursue areas of management not extensively treated in any other courses.

MGT 4833. Special Topics. 3 Credit Hours.
Permits a group of students and a professor to pursue areas of management not extensively treated in any other course.

MGT 4910. Special Problems. 1-3 Credit Hours.
Independent study conducted for one student under the guidance of a faculty member.

MGT 4911. Special Problems. 1-3 Credit Hours.
Independent study conducted for one student under the guidance of a faculty member.

MGT 4912. Special Problems. 1-3 Credit Hours.
Independent study conducted for one student under the guidance of a faculty member.

MGT 4XXX. Management Elective. 1-21 Credit Hours.

MGT 6000. Financial and Managerial Accounting I. 3 Credit Hours.
A foundation course in measuring and reporting the financial performance and status of the firm through financial reports and their construction, as well as basic concepts in cost and managerial accounting, valuation of assets, and revenue recognition..

MGT 6010. Business Taxation. 3 Credit Hours.
Comprehensive survey of federal taxation of business. A focus on tax planning and decision making will extend the study of the tax code regulations.

MGT 6015. Managerial Accounting II. 3 Credit Hours.
The course covers cost estimation, relevant costs, transfer pricing, capital budgeting, profitability analysis, performance evaluation, and activity-based management.

MGT 6020. Financial Reporting and Analysis I. 3 Credit Hours.
Study of the techniques and concepts surrounding the construction of financial reports, including Intermediate-level treatment of revenue recognition, inventories, contacts, interest capitalization, property and equipment, intangibles, long-term liabilities, and shareholders' equity. Significant emphasis on financial analysis.

MGT 6022. Financial Reporting and Analysis II. 3 Credit Hours.
Advanced topics on the techniques and concepts surrounding the construction and investigation of financial reports, including tax reporting, leases, pensions, liabilities, shareholders equity, and off-balance sheet items.

MGT 6028. Financial Analysis and Reporting of Technology Firms. 3 Credit Hours.
An in-depth look at reporting standards for, and the financial characteristics of technology firms, with an emphasis on the financial analysis of such firms.

MGT 6030. International Accounting. 3 Credit Hours.
An overview of accounting techniques and concepts surrounding the construction of financial reports related to issues arising from the increased internationalization of business. Topics include comparative financial reporting among countries and accounting treatments of international transactions.

MGT 6042. Auditing and Financial Control Systems. 3 Credit Hours.
This course covers professional issues surrounding auditing and financial control systems with a primary focus on financial statement analysis and auditor decision-making based on this analysis. Topics include management fraud, auditing standards, sampling methods, and collection of audit evidence.

MGT 6043. Advanced Financial Reporting. 3 Credit Hours.
Financial reporting techniques and concepts for mergers and acquisitions; consolidated financial statements; international transactions; partnerships; and governmental and not-for-profit financial reporting.

MGT 6045. Seminar in Advanced Accounting Topics. 3 Credit Hours.
An intensive treatment of a selection of contemporary accounting topics. Topical coverage may span subject matter ranging across the fields of auditing, systems, managerial, and tax accounting.

MGT 6046. Applications of Data Analytics in Accounting. 3 Credit Hours.
Students will learn to apply advanced analytical techniques in business settings to facilitate better decision making, with a particular focus on financial and managerial reporting.

MGT 6047. Ethics and Accounting. 3 Credit Hours.
The course is designed to expose students to issues surrounding accountants' professional ethics. Credit not allowed for both MGT 6047 and MGT 4047.

MGT 6051. Database Development and Applications. 3 Credit Hours.
The role of databases in the modern enterprise. Design and development of database systems, including data modeling, warehousing, normalization, and SQL. Applications in accounting marketing, operations, and human resource systems.

MGT 6053. Business Data Communications. 3 Credit Hours.
Introductory data communication concepts. Data communication applications in organizations. Overview of data communications products and services available from a technology consumer perspective.

MGT 6056. Electronic Commerce. 3 Credit Hours.
This course examines the business and technical issues related to electronic commerce applications and transactions that involve the use of computer networks. The course offers insight into digital business model analysis and design.

MGT 6057. Business Process Analysis and Design. 3 Credit Hours.
This course covers the analysis and redesign of business processes through technology. Special emphasis is given to enterprise information systems, such as ERP, and the application of emerging technologies to process redesign.

MGT 6058. Information Technology Practicum. 3 Credit Hours.
Students will work with participating organizations on a strategic question based on a current technology management issue that the company is facing. The strategic question will involve the business use of technology and will utilize the skills that students typically learn in the core IT management class.

MGT 6059. Emerging Technologies. 3 Credit Hours.
Teaches students a structured approach for analyzing emerging technologies and their business implications. To illustrate the approach, multiple emerging technologies are explored.

MGT 6060. Financial Management. 3 Credit Hours.
An introduction to finance. Topics include time value of money, capital budgeting, risk and return, capital structure dividend policy, and working capital management.

MGT 6066. Corporate Restructuring. 3 Credit Hours.
This course seeks to give students an understanding of issues in corporate restructuring. Topics include valuation, mergers, acquisitions, spin-offs, financial distress, corporate governance, and high leveraged transactions. The valuation techniques recquire students to develop forecasting skills and evaluate transactions using analytical and statistical tools.

MGT 6067. Financial Aspects of Commercial Real Estate. 3 Credit Hours.
The course will examine commercial real estate assets from two perspectives: the unique nature of the financing and ownership structures and their role as an asset class in investment portfolios. Students will build financial models to mathematically analyze the impact of these different structures on required returns and portfolio diversification.

MGT 6070. International Finance. 3 Credit Hours.
Financial management in an international setting. Topics include: international financial markets such as foreign exchange spot and derivatives markets, international economics (trade, balance of payments), forecasting exchange rates with statistical models, exchange risk management using financial models, international stock and bond markets, and international portfolio management.

MGT 6071. Multinational Financial Management. 3 Credit Hours.
This course emphasizes decision making for the multinational firm amidst exchange rate fluctuations, differing tax structures across countries, and political risk via case discussion and analysis.

MGT 6074. Fintech & Cryptocurrencies. 3 Credit Hours.
Digital innovation is disrupting Financial Intermediation like lending, payments, asset management, and insurance. This class gives a comprehensive understanding of the FinTech industry.

MGT 6076. Valuing Technology Firms. 3 Credit Hours.
The course involves valuing technology firms using the relative methods, discounted cash flow method and real options useful in mergers, acquisitions, and IPOs.

MGT 6078. Finance & Investments. 3 Credit Hours.
An introduction to finance, including the fundamental concepts of financial accounting, valuation, portfolio optimization, trading and investment strategies. The course develops and uses mathematical modeling, statistical analysis and programming tools. Credit not allowed for MGT 6078 and MGT 6080.

MGT 6080. Investments. 3 Credit Hours.
Introduction to securities markets and study of theory and practice of security analysis and portfolio management concepts as applied to equities and fixed-income securities. Portfolio management relies on probability theory, statistical analysis, and computational methods. Credit not allowed for MGT 6078 and MGT 6080.

MGT 6081. Derivative Securities. 3 Credit Hours.
An introduction to mathematical models used to price options, futures, and swaps is provided. Concepts of arbitrage, index trading, and portfolio insurance are discussed.

MGT 6082. Fundamentals of Real Estate Development. 3 Credit Hours.
An overview of the real estate development process from concept through design, feasibility, financing, construction, marketing, management and ultimate sale or long term financing.

MGT 6083. Real Estate Practicum. 3 Credit Hours.
Designed for graduate students with an interest in real estate. It consists of a one semester case study for a specific company or competitive program.

MGT 6086. Entrepreneurial Finance and Private Equity. 3 Credit Hours.
This course provides an introduction to financial theories and tools an entrepreneur needs to start, build, and harvest a successful venture. Cases and lecture will cover business evaluation and valuation, including the venture capital and the real option approach, forecasting models, quantitative and qualitative risk measurement methodologies, financing, venture capital funds, compensation structure and exit strategies. Credit not allowed for both MGT 6086 and MGT 4072.

MGT 6090. Management of Financial Institutions. 3 Credit Hours.
Introduction to the various risks faced by financial institutions and a detailed analysis of the tools used to manage these risks. Course requires understanding of fundamentals of probabilities and statistics to conduct analysis of financial institutions.

MGT 6100. Leadership and Organizational Behavior. 3 Credit Hours.
The focus of this course is on behavioral issues in the management of individual, team, and organizations' performance.

MGT 6101. Managing Human Resources. 3 Credit Hours.
An examination of the tools and procedures used by organizations to attract, select, and retain employees within the context of the legal and regulatory environment.

MGT 6106. Teamwork in Organizations. 3 Credit Hours.
The focus of the course is on understanding the use, management, and performance of teams and teamwork in organizational settings.

MGT 6107. Leadership and Organizational Change. 3 Credit Hours.
An examination of theories and practices for designing and implementing major organizational change and the role played by leadership, power, and influence in change process.

MGT 6110. Negotiation and Conflict Resolution. 3 Credit Hours.
This course covers the theory and process of negotiation and conflict resolution as it is practiced in different settings. Students develop understanding of other parties' interests and perspectives, personality, and conflict management styles, and learn to build effective relationships.

MGT 6111. Innovation and Entrepreneurial Behavior. 3 Credit Hours.
An examination of organizational policies, practices, and cultures that foster innovative and entrepreneurial behavior even in the context of large organizations.

MGT 6113. NonProfit Team Consulting Projects. 3 Credit Hours.
Teams work on a project developed in consultation with a not for profit organization, and present results to organizations and boards.

MGT 6114. Leadership Development. 3 Credit Hours.
Preparation for becoming leaders of organizations, to exercise leadership, and to embark on paths of personal leadership development through readings, lectures, speakers, leadership groups, personality assessment, and analysis of assessments relative to leadership and psychology of individuals and groups.

MGT 6116. The Role of Gender, Race and Ethnicity in Organizational Behavior. 3 Credit Hours.
This course will examine how managers and employees become more effective leaders by understanding the role gender, race and ethnicity plays in the life of the organization.

MGT 6118. Cross-Cultural Management. 3 Credit Hours.
This course develops students' global awareness to better understand and cope with the issues and challenges that managers face when working across international boundaries.

MGT 6119. Leading Teams. 3 Credit Hours.
This course prepares students to be an effective leader and manager of teams by giving students frameworks to implement and diagnose effective team processes.

MGT 6123. Information Technology Management. 2 Credit Hours.
A study in understanding and managing information technology, strategic uses of IT, and electronic commerce.

MGT 6124. Legal Environment of Business. 2 Credit Hours.
This course involves an examination of laws, rules, and standards of regulation and conduct, guidelines, and systems of conflict resolution relating to business operations and administration.

MGT 6125. Strategic Management. 2 Credit Hours.
Designed to provide a view of business organizations, with the focus on the total enterprise - the industry and competitive environment in which the organization operates.

MGT 6126. Integrative Management Experience (IME). 1 Credit Hour.
IME is a team-based and project-based course that requires students to draw on all core skills areas for successful completion.

MGT 6127. Business Communications. 1 Credit Hour.
Designed to improve verbal and written communication skills and the use of effective visuals for presentation through the understanding and application of a wide range of techniques.

MGT 6128. Business Ethics. 1 Credit Hour.
A participative class consisting of lectures by the instructor, case analysis, discussion of contemporary ethical business issues and presentations by speakers.

MGT 6130. Managerial Economics. 1.5 Credit Hour.
This course is designed to provide students with an understanding of basic economic concepts and an ability to apply these concepts to business decision-making and public policy analysis.

MGT 6134. Managerial Economics II. 1.5 Credit Hour.
A continuation of MGT 6130. Microeconomics to include game theory, information economics, oligopoly and auction and bargaining models.

MGT 6135. Macroeconomics for Managers. 3 Credit Hours.
This course is designed to provide future managers with an understanding of macroeconomics as well as how macroeconomic shocks can effect business operations.

MGT 6164. Corporate Strategy. 3 Credit Hours.
Corporate Strategy is the way a company creates value through the configuration and coordination of its multimarket activities.

MGT 6165. Venture Creation. 3 Credit Hours.
Students will learn theories and models to create new business ventures and how to apply the theories to predict venture performance. Requires completing a business plan, which describes and analyzes a proposed venture, including quantitative analysis to evaluate risk and how to shift probabilities toward success for the new venture.

MGT 6176. Managing the Growing Firm. 3 Credit Hours.
This course examines the challenges associated with the successful management of growth. Models and theories of firm growth will be reviewed.

MGT 6185. International Business Environments. 3 Credit Hours.
This course explores international environmental factors impacting firms' international operations and expansion. Concepts include economic, political, legal, socio-cultural and technology forces as well as data-driven corporate decisions under conditions of risk and uncertainty.

MGT 6190. Current Thinking In Strategy. 3 Credit Hours.
This course builds on the core strategic management course and strives to provide an in-depth and reflective coverage of current and emerging topics in strategic management, including theories such as real options, based on mathematical models applied to strategic business decisions. A key goal is to bridge the gap between rigorous strategy research based on advanced statistical techniques and managerial practice.

MGT 6197. Global Strategic Management. 3 Credit Hours.
This course provides a forum for the analysis of managerial and organizational demands associated with effectively competing in global industries. Students will learn strategic concepts, analytical frameworks, and heuristics for taking strategic decisions in the global context, such where to compete around the globe, which products and services to offer in which locations, where to locate business operations, and how to organize and effectively coordinate global activities .

MGT 6198. Corporate Entrepreneurship for Global Competitiveness. 3 Credit Hours.
This course examines how strategic pioneering actions and innovation are used by organizations to renew themselves, their markets, and their industries.

MGT 6203. Data Analytics in Business. 3 Credit Hours.
This course teaches the scientific process of transforming data into insights for making better business decisions. The use of examples places business analytics techniques in context and teaches students how to avoid the common pitfalls, emphasizing the importance of building proper models.

MGT 6213. Business Analytics for Managers. 3 Credit Hours.
This course covers the models, issues, and challenges of business analytics. Students develop business analytics models to business problems and understand the models' outputs.

MGT 6214. Business Analytics Practicum. 3 Credit Hours.
In this course, student teams work under the guidance of faculty practitioner on current real-world business challenges to apply business analytics skills & methods.

MGT 6300. Marketing Management I. 3 Credit Hours.
This course focuses on the activities of managers who make the everyday decisions that guide the marketing of goods and services. Students take the principles that they learn and apply them directly to solving relevant case problems.

MGT 6302. Consumer Behavior. 3 Credit Hours.
This course exposes students to fundamental concepts and approaches from the behavioral sciences that can be used to understand, predict, and influence.

MGT 6303. Sales and Promotion Management. 3 Credit Hours.
Students will obtain an understanding of the management of the sales function. The importance of the marketing-sales interface will be stressed.

MGT 6304. Customer Relationship Management. 3 Credit Hours.
Provides an understanding of analytic techniques and computer models in analyzing customer-centric data and developing customer relationship management (CRM) strategy.

MGT 6306. Business-to-Business Marketing. 3 Credit Hours.
This course studies the marketing of products or services for resale, for use in producing other goods and service operations of an enterprise.

MGT 6307. Integrated Marketing Communications. 3 Credit Hours.
An exploration of frameworks, processes, and tools used by organizations to develop and sustain effective marketing communications, with an emphasis on emerging communication channels.

MGT 6308. Strategic Brand Management. 3 Credit Hours.
Enables a thorough understanding of important issues involved in the planning, implementation, and evaluation of brand strategies. Exposes students to the appropriate theories, models, and tools to make better branding decisions. Provides a forum in which students apply these principles to real-life projects and business situations.

MGT 6310. Marketing Research: Analytics. 3 Credit Hours.
This course covers the fundamentals of the analytical aspects of marketing research. The course has an applied orientation with application to contemporary issues in marketing.

MGT 6311. Digital Marketing. 3 Credit Hours.
An applied overview of modernized digital marketing tools and strategy, emphasizing the diverse ways that contemporary marketers use information technology through digital channels such as social media and the Internet to achieve strategic business objectives.

MGT 6312. Marketing Research: Tools and Design. 3 Credit Hours.
Introduce and explain the marketing research process including identifying the problem, establishing objectives, designing methodologies, collecting data, and presenting results.

MGT 6314. Understanding Markets with Data Science. 3 Credit Hours.
This course applies a data science approach using network and text analytics to model and analyze how individuals and various kinds of markets behave.

MGT 6315. Marketing Analysis. 3 Credit Hours.
This course seeks to impart an understanding of the various applications of pricing, advertising, platform ecosystems, and social media marketing available for analyzing and interpreting marketing data and analytics .

MGT 6320. Building Implementable Market Response Models. 3 Credit Hours.
Knowing that a company can take actions that affect its own sales market response models can be used to aid in planning and forecasting. The models are estimated by regression techniques.

MGT 6325. Product Planning. 3 Credit Hours.
Examines the critical role that product and brand managers play in the organization, and issues inherent in managing product portfolios across a range of industries including consumer products, technology products, and consumer services. Topics include the new product development process, product portfolio strategies, brand/product positioning, and development of annual brand/product marketing plans.

MGT 6326. Collaborative Product Development. 3 Credit Hours.
Introduction to product development and product management topics through management science techniques and statistical analysis. These include product strategy, idea generation, experiment design, market development, managing product portfolios and positioning, testing of prototype systems, and brand management.

MGT 6335. International Marketing. 3 Credit Hours.
Students will obtain an understanding of marketing across national borders and cultures. The differences and similarities throughout marketing functions are explored.

MGT 6345. Marketing Practicum. 3 Credit Hours.
The course is designed to help MBA students gain hands-on experience in data analysis to solve marketing problems faced by companies. Students will meet regularly with companies on projects under faculty supervision.

MGT 6350. Production and Operations Management I. 3 Credit Hours.
This course focuses on the issues and techniques relevant to the management of the organization within and recognizing its strategic significance.

MGT 6351. Operations Resource Planning and Execution. 3 Credit Hours.
The management of material flows within an enterprise will be covered by tracking the evolution of operational planning and execution systems through the enterprise resource planning (ERP) framework.

MGT 6352. International Practicum. 3 Credit Hours.
A project-based course that provides an opportunity to apply decisions under uncertainty in global environments in the context of real and practical international business problems.

MGT 6353. Operations Strategy. 3 Credit Hours.
This course provides knowledge about developing, implementing, and evaluating operations strategy through conceptual frameworks and adaptive tools to impact operating decisions that impact profitability and adaptivity. Topics include managing technologies, capacaties, and the supply chain.

MGT 6357. Service Operations Management. 3 Credit Hours.
This course analyzes operational performance for the service sector and service support functions of manufacturers. Includes the design, delivery, variability, and innovation of services across many industries.

MGT 6359. Business Strategies For Sustainability. 3 Credit Hours.
Introduces business strategies such as eco-efficiency, product stewardship, green marketing and sustainable development. Cases, speakers reflect current issues such as electronics waste and global warming.

MGT 6360. Global Operations. 3 Credit Hours.
This course is designed to present issues critical to the globalization of operations, and addresses strategic and tactical issues pertaining to an organization's global operations and supply chain activities. Includes impact of technology, efficient vs responsive supply chains, and forecasting and sales and operations planning decisions.

MGT 6369. Sustainable Business Practicum. 3 Credit Hours.
Students work on real-world consulting projects focused on sustainability related challenge for companies, non-profits, and/or government organizations.

MGT 6400. Pricing Analytics and Revenue Management. 3 Credit Hours.
Focus in on increasing profit by measuring price responses and controlling capacity. Topics include forecasting, price optimization, and revenue management. Credit not allowed for both MGT 6400 and MGT 6362.

MGT 6401. Supply Chain Modeling. 3 Credit Hours.
Focus on the design and implementation of succesful supply chain strategies. Develop and recommend the right mix of operational levers through quantitative analysis for supply chain efficiency and effectiveness. Topics include: supply chain design, supply chain coordination, capacity management, retailing, and supplier management. Credit not allowed for both MGT 6401 and MGT 6362.

MGT 6405. Lean Six Sigma. 3 Credit Hours.
This class will explore the DMAIC model, lean tools and how data analysis can be leveraged to solve real world problems.

MGT 6450. Project Management. 3 Credit Hours.
Provides exposure to the concepts, frameworks and techniques for managing projects. Coverage includes both general project management frameworks along with agile methodologies commonly used to manage IT projects. Cases, problems, activities, software tools, extra readings, and guest speakers focus specifically on IT project management practice.

MGT 6451. Business Intelligence and Analytics. 3 Credit Hours.
Provides exposure to the concepts and methods of machine learning, frameworks and techniques for business intelligence and analytics, and real world applications.

MGT 6452. Machine Learning for Business. 3 Credit Hours.
This course introduces machine learning techniques and their applications in solving business problems. It covers core concepts, algorithm designs, and programming implementation with business.

MGT 6500. Analytical Tools for Decisions. 1.5 Credit Hour.
Introduction to the most commonly use statistical and optimization-based analytical tools for data-based decision-making based on the data available, including descriptive statistics, probability and distributions, hypothesis testing, and regression.

MGT 6501. Operations Management. 1.5 Credit Hour.
This course focuses on the strategic design and management of operations processes and policies to match supply with demand in an economically sustainable manner. Credit will not be awarded for both MGT 6501 and MGT 6350.

MGT 6502. Leading People and Organizations. 1.5 Credit Hour.
This course focuses on how to lead individuals and teams within organizations. This course will develop a systematic understanding of behavior within formal organizational settings. Credit will not be awarded for both MGT 6502 and MGT 6100.

MGT 6503. Managing Information Resources. 1.5 Credit Hour.
Focuses on emerging trends and business models in organizational information technology infrastructure, the information technology industry, and the tools to manage the information resources in an organization through techniques related to data management, analytics, and visualization.

MGT 6504. Principles of Finance. 1.5 Credit Hour.
Mathematic principles of finance including time value of money, risk and return relationship, capital budgeting. Credit will not be awarded for both MGT 6504 and MGT 6060.

MGT 6505. Marketing Management. 1.5 Credit Hour.
This course discusses the core elements of the marketing and the major types of marketing decisions faced by organizations. Develop the relevant skills for critically analyzing marketing actions. Credit will not be awarded for both MGT 6505 and MGT 6300.

MGT 6506. Managerial Economics. 1.5 Credit Hour.
Microeconomics is about scarcity and how individuals make choices in the face of scarcity. Topics include suppy/demand, markets and price system, risk/uncertainty, market limitations. Credit will not be awarded for both MGT 6506 and MGT 6130.

MGT 6507. Business Communications. 1.5 Credit Hour.
The purpose of this course is to provide future leaders and managers with the communication skills that enable them to sell themselves and their ideas. Credit will not be awarded for both MGT 6507 and MGT 6127.

MGT 6508. Strategic Management. 3 Credit Hours.
Strategic management builds on and integrates other functional core courses to understand how firms gain and sustain a competitive advantage. Credit will not be awarded for both MGT 6508 and MGT 6125 or MGT 6508 and MGT 6126.

MGT 6509. Legal and Ethical Considerations in Business. 1.5 Credit Hour.
Constitutional law; dispute resolution; torts; contracts; theories of ethical analysis; and the role of stakeholders. Credit will not be awarded for both MGT 6509 and MGT 6124 or MGT 6509 and MGT 6126.

MGT 6510. Leadership Development. 1.5 Credit Hour.
This course focuses on how to lead individuals and teams within organizations and will develop a systematic understanding of behavior within formal organizational settings.

MGT 6510P. Leadership Development Preparation. 0 Credit Hours.
This course focuses on how to lead individuals and teams within organizations and will develop a systematic understanding of behavior within formal organizational settings.

MGT 6600. Analytical Tools for Decision Support. 3 Credit Hours.
Exposes students to the most commonly used statistical and optimization-based analytical tools for decision support. The knowledge of these tools enables the decision maker to make informed decisions based on the data available.

MGT 6614. Law for Entrepreneurs. 3 Credit Hours.
This course will focus on legal issues which entrepreneurs face while growing a start-up business from infancy to becoming a publicly held company. Students will not receive credit for both MGT 6614 and MGT 3614.

MGT 6655. Business Data Preparation and Visualization. 3 Credit Hours.
This course helps business graduate students learn how to prepare and visualize data appropriately, to explore patterns and relations, and to convey these findings effectively.

MGT 6663. Technology Strategy. 3 Credit Hours.
Provides an understanding of economic and strategic factors that guide firms' strategic decisions regarding generation, commercialization, protection, and adoption of technological innovations.

MGT 6664. Managing Innovation. 3 Credit Hours.
This course focuses on how firms (both new and old) can create and capture value from product, process, and service innovations. To do so, this course will introduce students to analytical models and tools to guide strategic decision making related to innovations.

MGT 6665. Strategy Execution. 3 Credit Hours.
This course, focusing on strategy execution, answers this question: After performing strategy analysis and strategy formulation, how do you succeed in achieving strategic results? Students learn and apply theoretical models to execute strategies, including the use of a computer based quantitative simulation .

MGT 6667. Strat Entrepreneurship. 3 Credit Hours.
Provides a strategic perspective on the entrepreneurial process, competition and strategic interactions between startups and incumbents, cooperation and open innovation strategies.

MGT 6668. Behavioral Economics. 3 Credit Hours.
Behavioral economics studies individual decisions-making using tools at the intersection of economics and psychology.

MGT 6725. Information Security Strategies and Policies. 3 Credit Hours.
Information security vulnerabilities and risks; legal, cost, privacy, and technology constraints; derivation of strategies; technical and procedural means of achieving desired ends. Credit will not be awarded for both MGT 6725 and MGT 4725 or CS 4725 or CS 6725 or PUBP 4725 or PUBP 6725.

MGT 6726. Privacy, Technology, Policy, and Law. 3 Credit Hours.
This course takes a multi-disciplinary approach to privacy, a topic of great interest in the technology, policy, ethics, law, and business realms. Information collection, transmission, and utilization in analog and digital formats raise specific issues about information classification and organization; information storage and processing; and information transmission, transfer, and signaling. In addition, privacy tech policy affects the way one builds a network and related systems planning and design; human interfacing and use analysis; database development; and related aspects of hardware, software, economics, social factors, and capacity. Credit will not be awareded for both MGT 6726 and CS 4726 or CS 6726 or MGT 4726.

MGT 6727. Privacy for Professionals. 3 Credit Hours.
This course takes a multi-disciplinary approach to the study of privacy—a current topic of international interest for those in technology, policy, law, and/or business.

MGT 6748. Applied Analytics Practicum. 6 Credit Hours.
Practical analytics project experience applying ideas from the classroom to a significant project of interest to a business, government agency, or other organization.

MGT 6753. Principles of Management for Engineers. 3 Credit Hours.
The course will provide an introduction to selected topics needed to be successful in the technology industries. Crosslisted with ME 6753.

MGT 6769. Fixed Income Securities. 3 Credit Hours.
Description, institutional features, and mathematical modeling of fixed-income securities. Including risk analyses and hedging properties. Use of both statistical and stochastic models. Crosslisted with ISYE 6769 and MATH 6769. .

MGT 6772. Managing Resources of the Technological Firm. 3 Credit Hours.
This course explores the competitive advantage manufacturing and service firms derive from effective management of their technology, innovation, workforce, materials, and information resources as driven by uncertainty, global competition, and dynamic markets. Crosslisted with ISYE 6772.

MGT 6780. Knowledge Management. 3 Credit Hours.
The purpose of this course is to enable students to think conceptually about the modern organization as a knowledge- based, information-processing organization. Crosslisted with PUBP 6780.

MGT 6785. The Practice of Quantitative and Computational Finance. 3 Credit Hours.
Case studies, visiting lecturers from financial institutions, student group projects of an advanced nature, and student reports, all centered around quantitative and computational finance. Crosslisted with ISYE and MATH 6785.

MGT 6789. Technology Ventures. 3 Credit Hours.
Team discussion and case studies in biomedical engineering technology transfer, including licensing, financial capital, safety and efficacy studies, clinical trials and strategic planning. Crosslisted with BMED, ECE, CHE, and ME 6789.

MGT 6793. Advanced Topics in Quantitative and Computational Finance. 3 Credit Hours.
Advanced foundational material and analysis techniques in quantitative and computational finance.

MGT 6799. Legal Issues in Technology Transfer. 3 Credit Hours.
Biomedical science involves applying mathematical and scientific principles to the design, development, and operational evaluation of biomedical and health systems. Such discovery requires can lead to products such as integrated biomedical systems, instrumentation, medical information systems, artificial organs and prostheses, and health management and care delivery systems. But to take that discovery to patients and the market requires contecting that knowledge to legal questions about patentability, licensing, and ethics. This course studies and analyzes U.S. law as it applies to scientific discovery and the patenting and licensing processes. Crosslisted with BMED, CHE, ECE, and ME 6799.

MGT 6801. TI:GER Innovation Analysis. 3 Credit Hours.
This TI:GER course focuses on the analysis of technology innovation.

MGT 6802. TI:GER Innovation and Business Model Design. 3 Credit Hours.
This TI:GER course focuses on the design of business models for technology innovation.

MGT 6803. TI:GER Innovation Execution. 3 Credit Hours.
This TI:GER course focuses on the execution of launching and scaling technology innovation.

MGT 6813. Economic Analysis for Managers. 3 Credit Hours.
Economic reasoning and principles useful in understanding and solving managerial and public policy questions. Practice in analyzing major domestic and international economic events is included.

MGT 6821. TI:GER Innovation Research Methods 1. 1.5 Credit Hour.
This TI:GER course is the first of two courses focusing on research methods for technology innovation.

MGT 6822. TI:GER Innovation Research Methods 2. 1.5 Credit Hour.
This TI:GER course is the second of two courses focusing on research methods for technology innovation.

MGT 6830. Fundamentals of Innovation I. 3 Credit Hours.
First of a two-course sequence on various approaches needed to understand the innovation process, including patterns of technological change and intellectual property protection.

MGT 6831. Fundamentals of Innovation II. 3 Credit Hours.
Second of two-course sequence on various approaches needed to understand the innovation process, including competitive market analysis and valuing new technology.

MGT 6832. Fundamentals of Technology Commerercialization. 3 Credit Hours.
Follow-up to year-long course on Fundamentals of Innovation, emphasizing business planning and understanding the business, technology, and legal aspects of Venture Lab technologies.

MGT 6901. Consulting. 3 Credit Hours.
Students work in teams for client firms in a consulting capacity. The client firms are preselected, but the problem definition is derived from client-team negotiations.

MGT 6XXX. Management Elective. 1-21 Credit Hours.

MGT 7000. Master's Thesis. 1-21 Credit Hours.

MGT 7060. Theory of Finance. 3 Credit Hours.
This Ph.D. course is an introduction to theoretical financial economics. This course focuses on individuals' consumption and investment decisions under uncertainty and their implications on the valuation of securities.

MGT 7061. Empirical Finance. 3 Credit Hours.
This Ph.D. course is a survey of selected current empirical research topics in finance and related econometric issues.

MGT 7062. Corporate Restructuring. 3 Credit Hours.
This PhD course is an analysis of empirical research in corporate finance with a focus on issues related to corporate restructuring.

MGT 7063. International Finance. 3 Credit Hours.
This Ph.D. course is an introduction to the foundations of of modern international finance. Topics include: international portfolio diversification, design of country funds, tests of asset pricing, and international corporate finance.

MGT 7064. Microeconomics Theory for Management. 3 Credit Hours.
This course focuses on behavior of individual economic agents and how they interact to form markets. Topics include organizations, efficiency, and equilibria with incomplete information.

MGT 7101. Human Resources Management. 3 Credit Hours.
A Ph.D. course that covers an analysis of advanced practice, research, and theory in human resource management. Topics will vary by instructor and student interest.

MGT 7102. Organization Behavior Research Methods. 3 Credit Hours.
This Ph.D. course is an overview and analysis of research methodologies used in conducting scientific research of organizational behavior.

MGT 7105. Individual Behavior in Organizations. 3 Credit Hours.
This Ph.D. course is designed to investigate organizational behavior research topics at the individual level of analysis.

MGT 7106. Group Dynamics. 3 Credit Hours.
This Ph.D. course provides a fundamental understanding of group processes in organizations by analyzing and critiquing classic and contemporary theories and research on groups.

MGT 7107. Organizational Theory. 3 Credit Hours.
This Ph.D. course provides a review of contemporary organizational theories, and empirical studies of them to provide a framework to understand organizational structures, environments, and goals.

MGT 7305. Marketing Management and Strategy. 3 Credit Hours.
This Ph.D. course provides a survey of research and theory in the marketing management and strategy literature.

MGT 7306. Buyer Behavior. 3 Credit Hours.
Doctoral course in consumer behavior. Provides an introduction to the major theories in consumer behavior and discusses current research and methodology on theory development.

MGT 7308. Theory Construction in the Social Sciences. 3 Credit Hours.
Provides an understanding of key elements of a theory, and how influential theories are developed; a small part surveys topics in philosophy of science. Credit not allowed for both MGT 7308 and MGT 7307.

MGT 7320. Marketing Science. 3 Credit Hours.
This doctoral course addresses the literature on the state-of-the-art research on quantitative approaches to marketing problems.

MGT 7350. Operations Strategy I. 3 Credit Hours.
This Ph.D. seminar will discuss research papers dealing with strategic issues in operations management.

MGT 7352. Operations Planning and Control I. 3 Credit Hours.
This doctoral seminar will discuss research papers dealing with tactical and operational (planning and control) issues in operations management.

MGT 7353. Operations Planning and Control II. 3 Credit Hours.
This doctoral seminar is a continuation of MGT 7352 and will discuss advanced papers dealing with tactical and operational (planning and control) issues in operations management.

MGT 7354. Research Methods in Operations Management. 3 Credit Hours.
This doctoral seminar will discuss papers dealing with research methods in operations management.

MGT 7400. PhD Strategic Management Research I. 3 Credit Hours.
Ph.D.-level research seminar in strategic management.

MGT 7501. Managerial Econometric Modeling. 3 Credit Hours.
The linear regression model in managerial research: topics include ordinary and generalized least squares, panel data, instrumental variables, discrete choice and censored data.

MGT 8803. Special Topics in Management. 3 Credit Hours.
Topics of current interest.

MGT 8811. Special Topics. 1 Credit Hour.
Topics of current interest.

MGT 8812. Special Topics. 2 Credit Hours.
Topics of current interest.

MGT 8813. Special Topics. 3 Credit Hours.
Topics of current interest.

MGT 8823. Special Topics. 3 Credit Hours.
Topics of current interest.

MGT 8831. Special Topics. 1 Credit Hour.

MGT 8832. Special Topics. 1.5 Credit Hour.

MGT 8833. Special Topics. 3 Credit Hours.
Topics of current interest.

MGT 8853. Research Topics in Marketing. 3 Credit Hours.
Coverage of special research topics of current interest in marketing.

MGT 8873. Special Topics in Organizational Behavior. 3 Credit Hours.
Special research topics of interest in organizational behavior.

MGT 8903. Special Problems in Management. 1-21 Credit Hours.
Provides project work experience in the field of management.

MGT 8997. Teaching Assistantship. 1-9 Credit Hours.
For graduate students holding graduate teaching assistantships.

MGT 8998. Research Assistantship. 1-9 Credit Hours.
For graduate students holding graduate research assistantships.

MGT 9000. Doctoral Thesis. 1-21 Credit Hours.

Modern Languages (ML)

ML 1803. Special Topics. 3 Credit Hours.
Topics of current interest in Modern Languages, including Korean and Arabic.

ML 1804. Special Topics. 4 Credit Hours.
Topics of current interest in Modern Languages, including Korean and Arabic.

ML 1813. Special Topics. 3 Credit Hours.
Topics of current interest in modern languages.

ML 1814. Special Topics. 4 Credit Hours.
Topics of current interest in modern languages.

ML 1815. Special Topics. 5 Credit Hours.
Topics of current interest in modern languages.

ML 1823. Special Topics. 3 Credit Hours.
Topics of current interest in modern languages.

ML 1824. Special Topics. 4 Credit Hours.
Topics of current interest in modern languages.

ML 1833. Special Topics. 3 Credit Hours.
Topics of current interest in modern languages.

ML 1834. Special Topics. 4 Credit Hours.
Topics of current interest in modern languages.

ML 2500. Think Globally, Act Locally: An Introduction to Cross-Cultural Studies. 3 Credit Hours.
This course introduces students to literature and film from around the globe and teaches comparative literary and cultural studies analysis.

ML 2811. Special Topics. 1 Credit Hour.
Special Topics in Modern Languages.

ML 2813. Special Topics. 3 Credit Hours.
Topics of current interest in Modern Languages.

ML 3811. Special Topics. 1 Credit Hour.
Special Topics in Modern Languages.

ML 3812. Special Topics. 2 Credit Hours.
Topics of current interest in Modern Languages.

ML 3813. Special Topics. 3 Credit Hours.
Topics of current interest in Modern Languages.

ML 4811. Special Topics. 1 Credit Hour.
Special Topics.

ML 4812. Special Topics. 2 Credit Hours.
Special Topics.

ML 4813. Special Topics. 3 Credit Hours.
Topics of current interest in Modern Languages.

ML 6501. Theory and Foundations Seminar. 3 Credit Hours.
Survey of theories in Social and Intercultural Studies; Literary, Media Studies, and Critical Theory; and Linguistics, Language Application, and Technology. Taught in English.

ML 8801. Special Topics. 1 Credit Hour.

ML 8802. Special Topics. 2 Credit Hours.
Special Topics in Modern Languages.

ML 8803. Special Topics. 3 Credit Hours.
Special Topics in Modern languages.

ML 8804. Special Topics. 4 Credit Hours.
Special Topics in Modern languages and literature.

Manufacturing Leadership (MLDR)

MLDR 6701. Foundational Topics in the Manufacturing of Forest Bioproducts. 3 Credit Hours.
The course provides comprehensive foundational knowledge of the industry enabling the student to understand the role of diverse manufacturing operations and to strategically plan improvements. Cross-listed with CHBE 6701, CHBE 6741, ME 6741, CHEM 6741, MSE 6741, CHBE 6742, ME 6742, CHEM 6742, and MSE 6742.

MLDR 6800. Manufacturing Leadership Capstone Project. 3 Credit Hours.
Teams work to complete a capstone project provided at the beginning of the semester. Successful completion requires integration of the business, leadership and manufacturing courses.

MLDR 8803. Special Topics. 3 Credit Hours.
Special Topics in Manufacturing Leadership.

MLDR 8813. Special Topics. 3 Credit Hours.
Special Topics in Manufacturing Leadership.

MLDR 8823. Special Topics. 3 Credit Hours.
Special Topics in Manufacturing Leadership.

MLDR 8843. Special Topics. 3 Credit Hours.
Special Topics in Manufacturing Leadershi.

Management of Technology (MOT)

MOT 6102. Economic Analysis for Managers. 2 Credit Hours.
Studies the economic concepts that describe and explain the environment within which firms operate.

MOT 6103. Financial and Managerial Accounting. 2 Credit Hours.
Covers the basic concepts that underlie the use of accounting information. Includes balance sheet, income statement, alternative costing systems.

MOT 6104. Financial Management in an Environment of Technological. 2 Credit Hours.
Change. Course focuses on financial concepts and how they are used to maximize the value of the firm and choose among alternative courses of action.

MOT 6105. Analytical Tools for Decision Support. 2 Credit Hours.
This course focuses on statistics and mathematical modeling of use to decision makers in technology environments with significant uncertainty.

MOT 6106. Processes of Technological Innovation. 2 Credit Hours.
This course addresses the processes involved in technological innovation, focusing on models, sources, flows, and the protection of innovation.

MOT 6107. Technology Strategies in Information Systems. 2 Credit Hours.
This course examines information systems and their impact in manufacturing and service operations.

MOT 6109. Managing People in a Technical Environment. 2 Credit Hours.
This course focuses on the management and leadership of people and human resource systems in modern organizations.

MOT 6110. Technology and Transformational Work Processes. 2 Credit Hours.
This course focuses on how work processes within organizations can be designed and managed to optimize output effectiveness.

MOT 6111. Strategy Execution. 2 Credit Hours.
This course introduces methods to adapt, evolve, or create change in the way organizations structure themselves to increase effectiveness in responding to competitive demands.

MOT 6112. Marketing in a Technical Environment. 2 Credit Hours.
This course focuses on the marketing function, its relationship to other functions within the firm, and its strategic significance to high-tech organizations.

MOT 6114. Seminar in the Management of Technology. 2 Credit Hours.
This seminar features senior executives from organizations that develop or use technology discussing current practices, policies, and issues.

MOT 6115. AI & Machine Learning for Business. 2 Credit Hours.
This course examines key emerging technologies, their development patterns, and the associated impact on industries, industrial competitiveness, and society.

MOT 6116. Strategy in Management of Technology. 2 Credit Hours.
This course examines and discusses how technology-based firms develop and implement business, functional, and technology strategies.

MOT 6122. Management of Technology Project III. 2 Credit Hours.
Participants complete their MOT project research, submit a written report, and present their results to their organization.

MOT 6124. Business and Leadership Skills. 3 Credit Hours.
Participant's technological, business, and leadership skills (communications, teamwork, conflict resolution, diversity) are enhanced.

MOT 6125. Creating Technology Ventures. 3 Credit Hours.
This course covers the issues associated with the earliest stages of new technology venture formation.

MOT 6126. International Issues in the Management of Technology. 4 Credit Hours.
Global business issues and strategies are explored through an international study tour.

MOT 6127. Building Technology Ventures. 2 Credit Hours.
The foucs of this course is on learning how to manage rapid growth in a technology venture.

MOT 6128. Venture Financing. 2 Credit Hours.
In this course students learn various methods for raising capital to fund new ventures.

MOT 6129. International Business and Finance. 2 Credit Hours.
The purpose of this course is to develop students' understanding of global business and finance.

MOT 6130. Management of Technology Project I. 3 Credit Hours.
Participant's develop and present a proposal for a technology-based team venture project.

MOT 6131. Management of Technology Project II. 3 Credit Hours.
Participant's execute their MOT venture project, including marketing and financial analyses.

MOT 6132. Management of Technology Project I. 2 Credit Hours.
First in a sequence of three courses where students execute their new venture project. During this segment, they focus on concept definition and team formation.

MOT 6133. Ethical Decision Making. 1 Credit Hour.
This course focuses on understanding and applying ethical decision making practices in business.

MOT 6134. Management of Technology Project II. 2 Credit Hours.
Second in a sequence of three courses where students execute their new venture project. During this segment, they focus on marketing and financial analyses of their new technology venture.

Medical Physics (MP)

MP 4750. Diagnostic Imaging Physics. 3 Credit Hours.
Physics and image formation methods for conventional X-ray CT, nuclear medicine, and magnetic resonance and ultrasound imaging.

MP 4XXX. Medical Physics Elective. 1-21 Credit Hours.

MP 6011. Seminar in Medical Physics I. 1 Credit Hour.
Weekly 1-hour seminar on topics related to medical physics.

MP 6012. Seminar in Medical Physics II. 1 Credit Hour.
Weekly 1-hour seminar on topics related to medical physics.

MP 6101. Nuclear Medicine Physics. 3 Credit Hours.
Radioisotope production, radiopharmacy, planar gamma cameras, SPECT systems, PET systems, medical internal radiation dose (MIRD) method, nuclear medicine facilities and regulations.

MP 6201. Radiation Therapy Physics. 3 Credit Hours.
Clinical radiation oncology, phantom systems, radiation machines, photon beams, electron beams, brachythearpy, dose modeling and treatment planning.

MP 6203. Radiation Therapy Treatment Planning Laboratory. 1 Credit Hour.
Radiation therapy treatment planning course covering conventional radiation therapy treatment planning, monitor unit calculations, and advanced radiation treatment planning techniques.

MP 6204. Radiation Therapy Physics. 4 Credit Hours.
Measurement and calculation of absorbed dose, dose distributions, treatment planning, photon teletherapy, electron teletherapy, brachytherapy, clinical linear accelerators, quality assurance.

MP 6300. Radiological Anatomy. 1 Credit Hour.
A survey of the most clinically relevant anatomy as visualized by modern diagnostic imaging; plan radiographs, CT, MRI, and PET are emphasized.

MP 6401. Medical Health Physics. 3 Credit Hours.
Basics of medical health physics, Title 10, U.S. Code of Federal Regulations, Parts 19, 20 and 35, shielding for hospital radiation facilities.

MP 6402. Radiation Dosimetry. 2 Credit Hours.
Dosimetry of ionizing radiation: photons, neutrons, and charged particles; cavity theory; concept of exposure and absorbed dose; ion chambers and other types of integration dosimeters.

MP 6403. Applications of the Monte Carlo Method in Medical Physics. 3 Credit Hours.
Basic principles of the Monte Carlo method, Monte Carlo transport of photon and electron, various applications of the Monte Carlo method in medical physics.

MP 6405. Radiation Protection and Dosimetry. 3 Credit Hours.
Radiation dosimetry quantities, calculational and experimental methods for assessing the absorbed dose, effective dose assessment, committed effective dose assessment, radiation shielding methods.

MP 6406. Radiation Dosimetry & Protection. 4 Credit Hours.
Introduction to the calculation of radiation dose, dosimetry, and health physics.

MP 6407. Radiation Biology and Oncology. 3 Credit Hours.
Radiation lesions and repair, mechanisms of cell death, cell cycle effect, radiation sensitizers and protectors, tumor radiobiology, relative sensitivities of human tissues, and radiation carcinogenesis.

MP 6756. Radiation Physics. 3 Credit Hours.
Characteristics of atomic and nuclear radiation, transition probabilities, radioactivity abd isotopes, cross sections, electromagnetic radiation, neutrons, and charges particle interaction with matter. Crosslisted with NRE 6756 and HP 6756.

MP 6757. Radiation Detection. 3 Credit Hours.
Introduction to the theory and application of radiation detectors, measurement methods, signal processing, and data analysis. Crosslisted with HP 6757 and NRE 6757.

MP 6759. Radiation Shielding Principles and Analysis. 3 Credit Hours.
Principles of Radiation Shielding; Design of Shields; Computational Methods for Analysis of Shielding; Emphasis on Monte Carlo Simulation as a Shielding Tool.

MP 6XXX. Medical Physics Elective. 1-21 Credit Hours.

MP 7000. Master's Thesis. 1-21 Credit Hours.

MP 8011. Seminar in Medical Physics I. 1 Credit Hour.
Weekly one hour seminars on topics related to medical physics.

MP 8012. Seminar in Medical Physics II. 1 Credit Hour.
Weekly one hour seminar on topics related to medical physics.

MP 8014. Seminars in Medical Physics. 2 Credit Hours.
Seminars involving current research projects presented by graduate students, faculty, and invited speakers.

MP 8104. Clinical Rotations in Medical Physics. 3 Credit Hours.
Four hundred supervised contact hours of clinical internship in diagnostic imaging, nuclear medicine, and radiation oncology at the affiliated clinical facilities.

MP 8801. Special Topics. 1 Credit Hour.
Special topics offerings of current interest in medical physics not included in regular courses.

MP 8802. Special Topics. 2 Credit Hours.
Special topics offerings of current interest in medial physics not included in regular offerings.

MP 8803. Special Topics. 3 Credit Hours.
Special topics of current interest in medical physics not included in regular offerings.

MP 8804. Special Topics. 4 Credit Hours.
Special topics offerings of current interest in medical physics mot included in regular courses.

MP 8805. Special Topics. 5 Credit Hours.
Special topics offerings of current interest in medical physics not included in regular courses.

MP 8806. Special Topics. 6 Credit Hours.
Special topics offerings of current interest in medical physics not included in regular courses.

MP 8901. Special Problems. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in medical physics.

MP 8902. Special Problems. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in medical physics.

MP 8903. Special Problems. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in medical physics.

MP 8904. Special Problems. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in medical physics.

MP 8905. Special Problems. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in medical physics.

MP 8906. Special Problems. 1-21 Credit Hours.
Individual studies and/or experimental investigation of problems of current interest in medical physics.

MP 9000. Doctoral Thesis. 1-21 Credit Hours.

Materials Science & Engr (MSE)

MSE 1111. Introduction to Materials Science and Engineering. 1 Credit Hour.
A general introduction to the field of Materials Science and Engineering and the MSE curriculum at Georgia Tech.

MSE 1750. Introduction to Bioengineering. 3 Credit Hours.
An introduction to the field of bioengineering, including the application of engineering principles and methods to problems in biology and medicine, the integration of engineering with biology, and the emerging industrial opportunities. Crosslisted with AE, BMED, CHE, ECE, and ME 1750.

MSE 1801. Special Topics. 1 Credit Hour.
Topics of current interest not covered in other courses.

MSE 1802. Special Topics. 2 Credit Hours.
Topics of current interest not covered in other courses.

MSE 1803. Special Topics. 3 Credit Hours.
Topics of current interest not covered in other courses.

MSE 1XXX. Materials Science & Engineering Elective. 1-21 Credit Hours.

MSE 2001. Principles and Applications of Engineering Materials. 3 Credit Hours.
The structure-property-processing-performance relationships of engineering materials are described. Materials selection is treated as a part of engineering design.

MSE 2021. Materials Characterization. 4 Credit Hours.
The fundamentals of basic microstructural and compositional materials characterization techniques are presented with an emphasis on tools using electromagnetic radiation and electrons as stimuli.

MSE 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

MSE 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

MSE 2801. Special Topics. 1 Credit Hour.
Topics of current interest not covered in other courses.

MSE 2802. Special Topics. 2 Credit Hours.
Topics of current interest not covered in other courses.

MSE 2803. Special Topics. 3 Credit Hours.
Topics of current interest not covered in other courses.

MSE 2XXX. Materials Science & Engineering Elective. 1-21 Credit Hours.

MSE 3001. Chemical Thermodynamics of Materials. 3 Credit Hours.
Principles and applications of thermodynamics to materials science and engineering. Phase equilibria and the concepts necessary to interpret phase diagrams.

MSE 3002. Structural Transformations in Metallic, Ceramic, and Polymeric Systems. 3 Credit Hours.
Principles that govern the important structural transformations that occur in engineering materials.

MSE 3005. Mechanical Behavior of Materials. 3 Credit Hours.
The correlation of mechanical properties with atomic bonding, microstructure, and micromechanics, for applications relevant to materials selection and design, mechanical forming, and failure of materials.

MSE 3012. Thermal and Transport Properties of Materials. 3 Credit Hours.
The thermophysical and transport properties of solids and fluids, i.e. heat capacity, expansion, viscosity, conduction, convection, and radiation are discussed, along with thermal analysis instrumentation.

MSE 3015. Electrical, Optical, and Magnetic Properties. 3 Credit Hours.
Introduction to quantum mechanics and the band theory of solids to describe semiconducting, superconducting, dielectric, optical, and magnetic properties of nano- and micro-structured materials.

MSE 3021. Materials Laboratory I. 2 Credit Hours.
Characterization of engineering properties of materials through hands-on experiments. Instruction on basic laboratory skills, safety, statistical analysis of data, use of laboratory notebooks and technical report writing.

MSE 3025. Statistics and Numerical Methods in Materials Science and Engineering. 3 Credit Hours.
Concepts of computational modeling and statistics, with examples based on materials science and engineering applications.

MSE 3210. Transport Phenomena. 3 Credit Hours.
An introduction to transport emphasizing applications to materials. Credit not allowed for MSE 3210.

MSE 3220. Operations and Management Methods. 3 Credit Hours.
Principles and applications of production and operations management to the manufacturing enterprise, including process flow analysis, production planning and scheduling, optimization, quality management and facilities planning. Restricted to MSE majors. Credit not allowed for MSE 3220.

MSE 3225. Rheology. 3 Credit Hours.
Introduction to non-Newtonian fluid mechanics and rheology.

MSE 3230. Polymer and Fiber Processing. 3 Credit Hours.
Discussion of the principles of fiber formation from polymers including rheology, mechanics, energetics, phase transition, and polymer structure. High-performing fiber processing, and plastics processing. Credit not allowed for both MSE 3230 and PTFE 3230.

MSE 3300. Materials Science & Engineering of Sports. 3 Credit Hours.
The structure-property-performance relationships of engineered materials are described as it relates to past, present, and future use in sports.

MSE 3720. Introduction to Polymer/Fiber Enterprise. 3 Credit Hours.
Approaches the manufacture of engineered fibrous structures from a manager's viewpoint and gives a working knowledge and understanding of various processes used in producing polymers/fibers/fiber products. Restricted to non-MSE majors. Credit not allowed for MSE 3720.

MSE 3801. Special Topics. 1 Credit Hour.
Topics of current interest not covered in other courses.

MSE 3802. Special Topics. 2 Credit Hours.
Topics of current interest not covered in other courses.

MSE 3803. Special Topics. 3 Credit Hours.
Topics of current interest not covered in other courses.

MSE 3XXX. Materials Science & Engineering Elective. 1-21 Credit Hours.

MSE 4002. Ceramic Materials: Properties, Processing, Applications. 3 Credit Hours.
Properties, processing, and applications of the industrially and technically important ceramic materials. Traditional and oxide ceramics in addition to glass and nonoxide ceramics.

MSE 4004. Materials in Electronic Applications. 3 Credit Hours.
Basics of photolithography, screen printing, and tape casting. Requirements for fuel cells, magnetic nanocomposites, flat-panel displays, gas sensors, piezoelectric acutators, photonic crystals, etc.

MSE 4006. Processing and Applications of Engineering Alloys. 3 Credit Hours.
Solidification, deformation, and powder processing of metals and alloy;, microstructural design at nano- and meso-length scales; and structure-property correlations.

MSE 4010. Environmental Degradation. 3 Credit Hours.
Theory of environmental degradation of metals, ceramics, polymers, and biomaterials. Emphasis on the scientific principles of corrosion and physical degradation.

MSE 4022. Materials Laboratory II. 2 Credit Hours.
Processing, structure, properties relationships are explored through a series of hands-on experiments. Instruction on basic laboratory skills, safety, statistical analysis of data, use of laboratory notebooks and technical report writing.

MSE 4025. Fiber Product Manufacturing. 3 Credit Hours.
The manufacture of fiber products and their process- structure-property relationships are detailed, covering fibers, yarns, fabrics, nonwovens, carpets, composites, and related materials.

MSE 4026. Testing and Evaluation of Polymer and Fiber Products. 3 Credit Hours.
Properties influencing the end use performance of fiber and polymer products including that of plastic materials will be tested using standard ASTM, AATC and federal test methods. Standard statistical tools will be used to analyze and interpret the test data.

MSE 4100. Chemical Applications to Fiber Materials. 2 Credit Hours.
The chemical, thermal, and mechanical processes used in the preparation, coloration, printing and finishing of polymeric fiber materials are explored. Credit not allowed for MSE 4100.

MSE 4122. Fiber Chemistry Lab. 1 Credit Hour.
Laboratory course in preparation, coloration and finishing of fiber materials. Credit not allowed for MSE 4122.

MSE 4140. Polymer Physics. 3 Credit Hours.
Physical chemistry of polymer solutions, polymer miscibility, adsorptions, sorptions, plasticization, molecular weights, molecular weight distributions. Study of polymer surfaces. Credit not allowed for MSE 4140.

MSE 4230. Industrial Ctrls In MFG. 3 Credit Hours.
Introduction to industrial controls in manufacturing, process modeling, control of continuous-variable processes, digital control, discrete control, and control of manufacturing systems.

MSE 4315. Nondestructive Evaluation. 3 Credit Hours.
Principles and theory of industrial nondestructive evaluation methods are covered. Emphasis is on testing the soundness and reliability of primary and secondary engineering structures.

MSE 4320. Electronic Packaging and Design. 3 Credit Hours.
Electronic packaging design, covering properties of materials, fabrication and assembly processes, thermal-mechanical considerations, practical concerns regarding interconnection and processing issues, and reliability assessment.

MSE 4325. Thin Film Materials Science. 3 Credit Hours.
Introduction to principal vapor deposition processes and vacuum technology. The fundamentals of the formation, characterization, and properties of inorganic nano- to micro-scale thin films.

MSE 4330. Fundamentals of Nanomaterials and Nanostructures. 3 Credit Hours.
Introduction to nanotechnology. Description of various nanomaterials, their applications and synthesis methods.

MSE 4335. Soft Nano and Bio Materials. 3 Credit Hours.
Introduction soft nanomaterials and nanostructures that have been discovered and synthesized for prospective applications in nanotechnology.

MSE 4410. Capstone Engineering Design I. 3 Credit Hours.
A capstone engineering design course covering the principles of concurrent product/process design and development. Team-based projects will explore product/process design and development. Credit not allowed for MSE 4410.

MSE 4420. Capstone Engineering Design II. 3 Credit Hours.
A team problem-solving approach is used to work on a project developed in cooperation with industry. Weekly communications, both oral and written, are required. Credit not allowed for MSE 4420.

MSE 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

MSE 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

MSE 4723. Interdisciplinary Capstone Design. 3 Credit Hours.
Seniors will work in teams to apply a systematic design process to real multi-disciplinary problems. Problems selected from a broad spectrum of interest areas, including biomedical, environmental, mechanical, industrial design, electrical and thermal/fluids. Projects must be based on the knowledge and skills acquired in earlier course work, and incorporate appropriate engineering standards and multiple realistic constraints. Emphasis is placed on the design process, the technical aspects of the design, and on reducing the proposed design to practice. The course consists of faculty and guest lectures, prototyping in design studios, and a multi-disciplinary design project.

MSE 4740. Biologically Inspired Design. 3 Credit Hours.
We examine evolutionary adaptation as a source for engineering design inspiration, utilizing principles of scaling, adaptability, and robust multifunctionality that characterize biological systems. Credit not allowed for both MSE 4740 and (BIOL 4740 or ISYE 4740 or ME 4740).

MSE 4751. Introduction to Biomaterials. 3 Credit Hours.
Introduction to different classes of biomaterials (polymers, metals, ceramics) and physiological responses to biomaterial implantation. Topics include material properties, host response, and biomaterial characterization techniques. Crosslisted with BMED 4751.

MSE 4754. Electronics Packaging Assembly, Reliability, Thermal Management, and Test. 3 Credit Hours.
The course provides hands-on instruction in electronics packaging, including assembly, reliability, thermal management, and test of next-generation microsystems. Crosslisted with ECE and ME 4754.

MSE 4755. Electronic Packaging Substrate Fabrication. 3 Credit Hours.
This course provides students with hands-on instruction in basic SOP concepts and techniques, including interconnect design, substrate material selection and properties, photodielectric deposition, via formation and photolithography, copper metallization, and finally, substrate testing. Laboratory instructions are augmented by an interactive multimedia educational presentation that makes the course work material remotely accessible via the internet.

MSE 4759. Electrochemical Energy Storage and Conversion. 3 Credit Hours.
An elective class for senior-level students interested in electrochemical storage and conversion, including the fundamentals of electrochemistry and practical battery and fueld cells. Cross-listed with ChBE and ME 4759.

MSE 4761. Industrial Controls and Manufacturing. 3 Credit Hours.
Students are introduced to industrial controls and the fundamentals of manufacturing with hands-on experience based on lab projects using industry software and hardware for communications and control. Credit not allowed for MSE 4761.

MSE 4766. Fabrication and Properties of Nanoscale Devices. 3 Credit Hours.
Fundamental properties at the nanoscale for photonics and sensors. Nanoscale fabrication methods including thin films, ion beam, lithography, electroplating, and example case studies in NEMS/MEMS and photonics. Credit not allowed for both MSE 4766 and ME 4766.

MSE 4775. Polymer Science and Engineering I: Formation and Properties. 3 Credit Hours.
An introduction to the chemistry, structure, and formation of polymers, physical states and transitions, physical and mechanical properties of polymer fluids and solids. Crosslisted with CHE, CHEM, and ME 4775.

MSE 4776. Polymer Science and Engineering II: Analysis, Processing, and Laboratory. 3 Credit Hours.
Polymer fabrication processes and methods of characterization and identification of polymers are presented. Experiments in polymerization, processing, and property evaluation of polymers. Crosslisted with CHE, CHEM, ME, and TFE 4776.

MSE 4790. Materials Selection and Design. 3 Credit Hours.
Principles of selecting materials and processes for engineering applications. Methodologies for designing new materials and conceiving hybrid solutions. Credit not allowed for both MSE 4790 and ME 4213 (or ME 4790).

MSE 4791. Mechanical Behavior of Composites. 3 Credit Hours.
Introduction to properties and structures of common matrix and reinforcing materials, mechanics of fiber-reinforced composites, lamina and laminate analysis, and mechanical performance. Crosslisted with AE, CEE, CHE, and ME 4791.

MSE 4793. Composite Materials and Processing. 3 Credit Hours.
Basic principles of selecting component materials and manufacturing composites are presented. Polymeric, metallic, and ceramic systems are considered. Crosslisted with AE, CEE, CHE, and ME 4793.

MSE 4794. Composite Materials and Manufacturing. 4 Credit Hours.
Basic principles of selection and design of composite materials and their manufacturing and testing. Cost factors. Laboratory exercises on manufacturing and tests. Crosslisted with AE, CEE, CHE, and ME 4794.

MSE 4795. Fundamental Elements of Nuclear Reactor Materials. 3 Credit Hours.
Introduction to fundamentals of nuclear reactor materials. Topics covered are basics of radiation damage, defect creation and evolution, microstructure-property correlations in cladding and fuel of nuclear materials.

MSE 4801. Special Topics. 1 Credit Hour.

MSE 4802. Special Topics. 2 Credit Hours.

MSE 4803. Special Topics. 3 Credit Hours.

MSE 4901. Special Problems. 1-21 Credit Hours.

MSE 4902. Special Problems. 1-21 Credit Hours.

MSE 4XXX. Materials Science & Engineering Elective. 1-21 Credit Hours.

MSE 6001. Written and Visual Communications. 2 Credit Hours.
Writing and editing engineering documents; designing and explaining visuals; creating electronic presentations. May not be used for duplicate credit with MSE 6754.

MSE 6010. Fundamentals of Functional Materials. 3 Credit Hours.
This course focuses on the effects of defects on physical properties; charge/mass transport; semiconductors, heterojunctions, electrical and magnetic polarization, interaction processes between various physical properties; electrical characterization techniques.

MSE 6105. Diffraction Studies. 3 Credit Hours.
Principles and theory of crystallography and diffraction analysis of materials are covered, emphasizing X-ray diffraction, including electron diffraction and diffraction-based imaging. Reciprocal lattice concepts are emphasized.

MSE 6110. Transmission Electron Microscopy. 3 Credit Hours.
Introduction to the kinematical electron scattering theory, optics in TEM, diffraction contrast imaging of defects, dynamical electron diffraction effects; and chemical microanalysis using EDS.

MSE 6120. Quantitative Characterization of Microstructures. 3 Credit Hours.
Application of statistically unbiased methods for estimating geometrical attributes of microstructures and nonplanar fracture surfaces from plane sections and projections, digital image analysis, and computer simulations of microstructures.

MSE 6130. Surface Analysis. 3 Credit Hours.
Introduction to vacuum science and technology; structure of solid surfaces; electron and ion energy analyzers, electron spectroscopies (e.g., AES and XPS); ion-based techniques (e.g., SIMS and RBS); depth profiling; ion channeling.

MSE 6140. Computational Materials Science and Engineering. 3 Credit Hours.
This course aims to provide a broad understanding of a spectrum of modern state-of-the-art computational methods used in materials science and engineering.

MSE 6210. Defects. 3 Credit Hours.
Emphasis on the origin and character of point, line, and surface defects in crystalline materials and their influence on mechanical, chemical, magnetic, optical, and electronic properties.

MSE 6310. Thermodynamics and Kinetics of Transformations. 3 Credit Hours.
Classical thermodynamics and phase equlibria with applications to chemical reactions, control of phase transformations via reduction of chemical-free energy, strain energy, and interfacial energy.

MSE 6335. Fundamentals of Soft Nanomaterials and Nanostructures. 3 Credit Hours.
Fundamentals and applications of soft (polymer and biological) nanomaterials such as colloidal assemblies, self-assembled structures, energy devices, photonic materials, drug delivery, flexible electronics, soft robotics.

MSE 6401. Thermodynamics of Materials. 3 Credit Hours.
To examine the principles of thermodynamics as applied to equilibria associated with solutions, mixtures, chemical reactions, and interfaces in materials.

MSE 6402. Crystallography, Structure and Defects. 3 Credit Hours.
Provides students with a fundamental understanding of crystal structures, symmetry, origin, character, defects in crystalline materials, and the influence of these defects on different properties.

MSE 6403. Kinetics of Phase Transformations. 3 Credit Hours.
To introduce the fundamentals of thermodynamics and mathematics to the kinetics of diffusional and non-diffusional phase transformation in engineering materials.

MSE 6404. Scattering Theory. 3 Credit Hours.
A general introduction to the scattering/diffraction of electromagnetic radiation from solids. The kinematical formalism is developed emphasizing x-ray scattering as a characterization tool.

MSE 6405. Advanced Nanomaterials. 3 Credit Hours.
Topics include the synthesis and growth processes controlling quantum dot formation, nanowires, and three- dimensional self-assembled nanostructures. Additional characterization techniques and emerging applications are presented.

MSE 6406. Corrosion of Materials. 4 Credit Hours.
To introduce students to the basic kinetic mechanisms associated with the interactions of materials with liquids and gases.

MSE 6407. Biological Properties. 3 Credit Hours.
Addresses structure-property relationship of cellular components.

MSE 6408. Quantum Mechanics - MSE. 3 Credit Hours.
Fundamental of quantum mechanics of atoms, molecules and solids necessary for engineers to understand the electronic, optical and thermal properties of inorganic and organic materials.

MSE 6409. Fundamentals of Corrosion. 3 Credit Hours.
Course covers thermodynamics, and kinetics of metallic corrosion in electrolytes and high-temperature oxidation. Different forms of corrosion, their mechanisms, and corrosion control methods are discussed.

MSE 6411. Thermodynamics of Materials. 3 Credit Hours.
This course introduces structural features of materials, including point/space groups, representative crystal structures, quasi-crystals, amorphous and rubbery state, liquid crystals, colloids, solutions, and effect of symmetry on properties.

MSE 6412. Structure of Materials. 3 Credit Hours.
This course introduces structural features of materials, including point/space groups, representative crystal structures, quasi-crystals, amorphous and rubbery state, liquid crystals, colloids, solutions, and effect of symmetry on properties.

MSE 6500. Thermodynamics of Materials. 2 Credit Hours.
To examine the principles of thermodynamics as applied to equilibria associated with solutions, mixtures, chemical reactions, and interfaces in materials.

MSE 6501. Phase Equilibria. 1 Credit Hour.
The object of this course is to review the concepts of phase equilibria in ceramic and metallic systems and develop the methodology to calculate phase diagrams in these systems.

MSE 6502. Thermo Analysis. 1 Credit Hour.
To examine the principles of thermodynamics as applied to equilibria associated with mixtures and solutions.

MSE 6510. Polymers for Electronic and Photonic Applications I. 3 Credit Hours.
Review of fundamentals and principles of polymers used in electronics and photonics; relationships between the advances of semiconductor technology and the importance of polymers and their applications.

MSE 6600. Advanced Polymer Processing. 3 Credit Hours.
Common polymer processing techniques and recent advancement; Modeling of polymer processing focusing on how to build a sound model; Computer aided engineering for polymer processing.

MSE 6601. Carbon Nanotubes, Graphene, and Nanocomposites. 3 Credit Hours.
Synthesis, characterization, and properties of carbon nanotubes and graphene. Carbon nanotube and graphene dispersion in various media. Carbon nanotube and graphene nano-composites processing and applications.

MSE 6602. Tensor Analysis and Mathematical Techniques for Materials. 3 Credit Hours.
Introduction to tensor analysis and mathematical techniques for solving problems enountered in materials physics, processing and characterization, particularly involving polymeric fluids and solids.

MSE 6603. Natural Polymers. 3 Credit Hours.
The structures and properties of natural products are presented. Production of cellulose and proteins in discussed. Credit not allowed for both MSE 6603 and PTFE 6301.

MSE 6610. Biomaterials. 2 Credit Hours.
The course will emphasize the interaction between the human body environment and synthetic materials. Materials for both medical implants and dental restoration and appliances will be covered.

MSE 6620. Advanced Corrosion. 3 Credit Hours.
The emphasis will be on electrochemical corrosion and dry oxidation of metals and alloys. In the laboratory, the student will be introduced to the methodology of corrosion testing.

MSE 6730. Materials Science of Cellular Components. 3 Credit Hours.
Addresses structure-property relationship of cellular components. Credit not allowed for both MSE 6730 and BMED 6730.

MSE 6750. Preparation & Reactions of Polymers. 3 Credit Hours.
A detailed treatment of the reactions involved in the synthesis of both human-made and natural polymers, including preparation and degradative reactions of polymer systems.

MSE 6751. Physical Chemistry of Polymer Solutions. 3 Credit Hours.
Study of polymer solutions, polymer miscibility, adsorption, sorptions, plasticization, molecular weights, molecular weight distribution, and interfacial phenomena using thermodynamics and statistical mechanics. Crosslisted with CHEM, CHE, and PTFE 6751.

MSE 6752. Polymer Characterization. 4 Credit Hours.
This course introduces the student to surface, near-surface and structural methods of polymer characterization. Specialized techniques critical to physical structure are emphasized. Crosslisted with CHEM, CHE, and PTFE 6752.

MSE 6754. Engineering Communication. 3 Credit Hours.
Writing and editing engineering documents; designing and explaining visuals; creating and delivering electronic presentations. Crosslisted with CEE 6754.

MSE 6755. Theoretical Chemistry of Polymers. 3 Credit Hours.
Thermodynamics and microscopic dynamics of polymers. Fundamental concepts, including scaling concepts, governing anisotropy of polarizability, phase transitions, morphology, time-dependent correlations, etc. are discussed. Crosslisted with CHEM and PTFE 6755.

MSE 6757. Advanced Polymer Chemistry. 3 Credit Hours.
Advanced topics in synthetic polymerization methodology, polymer structure, and polymer properties in solution and the solid state.

MSE 6759. Materials in Environmentally Conscious Design and Manufacturing. 3 Credit Hours.
Covers the environmental impact of materials choices and quantitative measure of life-cycle assessment and environmental burden. The Natural Step philosophy will be used as a model for the overall approach. Crosslisted with ME and PTFE 6759.

MSE 6768. Polymer Structure, Physical Properties, and Characterization. 3 Credit Hours.
Formulations and analysis of molecular and phenomenological models of elastic and viscoelastic behavior, development and description of structure, and fundamental aspects of structure-property relations. Crosslisted with TFE, CHE, and ME 6768.

MSE 6774. Biomaterials: Structure and Function. 3 Credit Hours.
Structure-function relationships of biomaterials and biomaterial characterization will be covered. Materials for medical implants, tissue engineering, biosensing, imaging, and drug delivery will be covered. Crosslisted with BMED, CHE, and ME 6774.

MSE 6775. Polymer Communications. 1 Credit Hour.
Oral and written presentation of modern polymer topics, with an emphasis on constructive and ethical critical thinking in a group setting.

MSE 6776. Integrated Low-cost Microelectronics Systems Packaging. 3 Credit Hours.
Broad overview of system-level, cross-disciplinary microelectronics packaging technologies, including design, test, thermal, reliability, optoelectronics, and RF integration. Comparison of system-to-chip and system-to-package. Crosslisted with ECE and ME 6776.

MSE 6777. Advanced Biomaterials. 3 Credit Hours.
Advanced topics of biomaterials performance and engineering, including biointerfaces, host reactions to materials, and bio-inspired/smart-materials strategies. Crosslisted with BMED, CHE, and ME 6777.

MSE 6795. Mathematical, Statistical, and Computational Techniques in Materials Science. 3 Credit Hours.
Fundamental physical, analytical, and mathematical techniques encountered in materials engineering including stress and strain, crystallographic and orientation transformations, X-ray, TEM, and solid-state concepts are emphasized. Crosslisted with ME and PTFE 6795.

MSE 6796. Structure-Property Relationships in Materials. 3 Credit Hours.
Introduction to the multi-scale structure effects on material properties. Course will prepare students for future in-depth courses. Crosslisted with PTFE and ME 6796.

MSE 6797. Thermodynamics and Kinetics of Microstructural Evolution. 3 Credit Hours.
The reduction of chemical-free, strain, and interfacial energies control of the kinetics of diffusional transformations. These factors are explored from the viewpoint of processing and stability of microstructure during service. Crosslisted with PTFE and ME 6797.

MSE 6XXX. Materials Science & Engineering Elective. 1-21 Credit Hours.

MSE 7000. Master's Thesis. 1-21 Credit Hours.

MSE 7010. Electroceramics. 3 Credit Hours.
Defects chemistry; electrochemical and electrophysical behavior of metallic/semiconducting ceramics, dielectrics, and ferrites; device applications of various electronic ceramics.

MSE 7110. Advanced Transmission Electron Microscopy. 3 Credit Hours.
Introduction to theory, techniques, and applications of high-resolution transmission electron microscopy (HRTEM) in materials research.

MSE 7140. Impedance and Dielectric Spectroscopy. 3 Credit Hours.
The basic theory of how current, voltage, and phase angle measurements over a wide frequency range (typically mHz-MHz) can provide information about microstructural features at all length scales.

MSE 7210. Dislocation and Deformation Mechanics. 3 Credit Hours.
Emphasis on interactions of dislocations with other defects, dislocation dynamics, and their correlation with mechanical properties under different rates of loading.

MSE 7420. Solidification Processing. 3 Credit Hours.
Fundamentals of thermodynamics, kinetics, mass transport, and physical materials are applied to the development of microstructure during solidification.

MSE 7510. Polymers for Electronic and Photonic Applications II. 3 Credit Hours.
Review of fundamentals and principles of polymers used in electronics and photonics. The relationship between the recent advances of semiconductor technology and the importance of polymers will be discussed.

MSE 7757. Teaching Practicum. 3 Credit Hours.
Students will learn about what it takes to be a faculty through sills needed for “delivery of lecture” via the practice of teaching.

MSE 7771. Mechanics of Polymer Solids and Fluids. 3 Credit Hours.
Continuum mechanics of solids and fluids; mechanics of deformation of anisotropic polymers; yield, breaking and fatigue; non-Newtonian vioscous and viscoelastic behavior of polymer fluids. Crosslisted with CHE, ME and PTFE 7771.

MSE 7772. Fundamentals of Fracture Mechanics. 3 Credit Hours.
Advanced study of failure of structural materials under load, mechanics of fracture, and microscopic and macroscopic aspects of the fracture of engineering materials. Crosslisted with AE, CEE, CHE, and ME 7772.

MSE 7773. Advanced Fracture Mechanics. 3 Credit Hours.
Nonlinear fracture mechanics including elastic-plastic and time-dependent fracture, advanced test methods, J-integral theory, and extensions. Crosslisted with AE, CEE, CHE, and ME 7773.

MSE 7774. Fatigue of Materials and Structures. 3 Credit Hours.
Mechanical and microstructural aspects of nucleation and growth of cracks under cyclic loading conditions, notch effects, cumulative damage, multiaxial loading, and fatigue crack propagation. Crosslisted with AE, CEE, CHE, and ME 7774.

MSE 7775. Topics in Fracture and Fatigue of Metallic and Composite Structures. 3 Credit Hours.
Brittle and ductile failure criteria. Failure prediction in composite structures. Free-edge and internal delamination. Anisotropic cracks. Fatigue behavior of composites and comparison with metal fatigue. Crosslisted with AE, CHE, and ME 7775.

MSE 7791. Damage, Failure, and Durability of Composite Material. 3 Credit Hours.
Analysis and failure of fiber-reinforced composite material systems. Mechanisms of toughening, multiple cracking mechanisms. Failure in woven fabric, braided, and special geometry composites. Crosslisted with AE, CHE, CEE, ME, and PTFE 7791.

MSE 7792. Advanced Mechanics of Composites. 3 Credit Hours.
Anisotropic elasticity, hygrothermal behavior, stress analysis of laminated composites including 3-D effects, stress concentrations, free-edge effects, thick laminates, adhesive and mechanical connections, fracture of composites. Crosslisted with AE, CHE, CEE, ME, and PTFE 7792.

MSE 7793. Manufacturing of Composites. 3 Credit Hours.
Major manufacturing techniques for metal, ceramic, and polymer composites. Modeling of processes with emphasis on fundamental mechanisms and effects. Crosslisted with AE, CHE, CEE, ME, and PTFE 7793.

MSE 8001. Seminar. 1 Credit Hour.
The latest advances in research and development will be presented by the enrolled students from articles in recent issues of recognized periodicals.

MSE 8200. Advanced Presentation Skills. 1 Credit Hour.
Designing and explaining visuals; creating and delivering scientific electronic presentations; learning to speak and present to a variety of audiences.

MSE 8801. Special Topics. 1 Credit Hour.
Special topic offerings of current interest not included in regular courses.

MSE 8802. Special Topics. 2 Credit Hours.
Special topic offering of current interest not included in regular courses.

MSE 8803. Special Topics. 3 Credit Hours.
Special topic offering of current interest not included in regular courses.

MSE 8813. Special Topics. 3 Credit Hours.
Special Topics in MSE.

MSE 8901. Special Problems. 1-21 Credit Hours.
Lectures, laboratory, and library work on special topics of current interest in materials suitable for a master's degree candidate.

MSE 8902. Special Problems. 1-21 Credit Hours.
Lectures, laboratory, and library work on special topics of current interest in materials suitable for a master's degree candidate.

MSE 8903. Special Problems. 1-21 Credit Hours.
Lectures, laboratory, and library work on special topics of current interest in materials suitable for a master's degree candidate.

MSE 8997. Teaching Assistantship. 1-9 Credit Hours.
For graduate students holding teaching assistantships.

MSE 8998. Research Assistantship. 1-9 Credit Hours.
For graduate students holding a research assistantship.

MSE 9000. Doctoral Thesis. 1-21 Credit Hours.

MSE 9999. GT-PKU. 12 Credit Hours.
For GT-PKU students during terms when they are not taking other GT courses. Placeholder course.

Military Science & Leadership (MSL)

MSL 1001. Leadership and Personal Development. 3 Credit Hours.
Introduces cadets to the personal challenges and compentencies that are critical for effective leadership. Cadets learn how the personal development of life skills such as critical thinking, goal setting, time management, physical fitness, and stress management relate to leadership, officership, and the Army profession. The focus is on developing basic knowledge and comprehension of Army leadership dimensions while gaining a big picture understanding of the ROTC program, its purpose in the Army, and its advantages for the student.

MSL 1002. Introduction to Tactical Leadership. 3 Credit Hours.
Overviews leadership fundamentals such as setting direction, problem-solving, listening, presenting briefs, providing feed-back, and using elective writing skills. Cadets explore dimensions of leadership values, attributes, skills and actions in the context of practical, hands-on, and interactive exercises. Continued emphasis is placed on recruitment and retention of cadets. Cadre role models and the building of stronger relationships among the cadets through common exercise and practical interaction are critical aspects of this course.

MSL 1XXX. Military Sci Elective. 1-21 Credit Hours.

MSL 2001. Innovative Team Leadership. 3 Credit Hours.
Explores the dimensions of creative and innovative tactical leadership strategies and styles by examining team dynamics and two historical leadership theories that form the basis of the Army leadership framework (trait and behavior theories). Cadets practice aspects of personal motivation and team building in the context of planning, executing, and assessing team exercises and participating in leadership labs. Focus is on continued development of the knowledge of leadership values and attributes through an understanding of Army rank, structure, duties and basic aspects of land navigation and squad tactics. Case studies provide tangible context for learning the Soldier's Creed and Warrior Ethos as they apply in the contemporary operating environment (COE).

MSL 2002. Foundations of Tactical Leadership. 3 Credit Hours.
Examines the challenges of leading tactical teams in the complex contemporary operating environment (COE). The course highlights dimensions of terrain analysis, patrolling, and operation orders. Further study of the theoretical basis of the Army leadership framework explores the dynamics of adaptive leadership in the context of military operations. Cadets develop greater self awareness as they assess their own leadership styles ad practice communication and team building skills. COE case studies give insight into the importance and practice of teamwork and tactics in real-world scenarios.

MSL 2XXX. Military Sci Elective. 1-21 Credit Hours.

MSL 3001. Adaptive Tactical Leadership. 4 Credit Hours.
Challenges cadets to study, practice, and evaluate adaptive leadership skills as they are presented with challenging scenarios related to squad tactical operations. Cadets receive systematic and specific feedback on their leadership attributes and actions. Based on such feedback, as well as their own self evaluations, cadets continue to develop their leadership and critical thinking abilities. The focus is developing cadets' tatical leadership abilities to enable them to succeed at ROTC's summer Leadership Development and Assessment Course (LDAC).

MSL 3002. Leadership in Changing Environments. 4 Credit Hours.
Uses increasingly intense situational leadership challenges to build cadet awareness and skills in leading tactical operations up to platoon level. Cadets review aspects of combat, stability, and support operations. They also conduct military briefings and develop proficiency in garrison operation orders. The focus is on exploring, evaluating, and developing skills in decision-making, persuading, and motivating team members in the contemporary operating environment (COE). Cadets are evaluated on what they know, and do as leaders as they prepare to attend the ROTC summer Leadership Develpment Assessment Course (LDAC).

MSL 3XXX. Military Sci Elective. 1-21 Credit Hours.

MSL 4001. Developing Adaptive Leaders. 4 Credit Hours.
Develops cadet proficiency in planning, executing, and assessing complex operations, funtioning as a member of a staff, and providing performance feedback to subordinates. Cadets assess risk, make ethical decisions, and lead fellow ROTC cadets. Lessons on military justice and personnel processes prepare cadets to make the transition to Army officers. MSIV cadets analyze, evaluate, and instruct cadets at lower levels. Both their classroom and battalion leadership experiences are designed to prepare cades for their first unit of assignment. They identify responsibilities of key staff, coordinate staff roles, and use situational opportunitites to teach, train, and develop subordinates.

MSL 4002. Leadership in a Complex World. 4 Credit Hours.
Explores the dynamics of leading in the complex situations of current military operations in the contemporary operating environment (COE). Cadets examine differences in customes and courtesies, military law, principles of war, and rules of engagement in the face of international terrorism. They also explore aspects of interacting with non-government organizations, civilians on the battlefield, and host national support. The course places significant emphasis on preparing cadets for their first unit of assignment. It uses case studies, scenarios, and "What now Lieutenant?" exercises to prepare cadets to face the complex ethical and practical demands of leading as commissioned officers in the United States Army.

MSL 4801. Special Topics. 1 Credit Hour.
Topics and research will pursue areas of military science not extensively treated in other Military Science courses.

MSL 4802. Special Topics. 2 Credit Hours.
Topics and research will pursue areas of military science not extensively treated in other Military Science courses.

MSL 4803. Special Topics. 3 Credit Hours.
Topics and research will pursue areas of military science not extensively treated in other Military Science courses.

MSL 4804. Special Topics. 4 Credit Hours.
Topics and research will pursue areas of military science not extensively treated in other Military Science courses.

MSL 4805. Special Topics. 5 Credit Hours.
Topics and research will pursue areas of military science not extensively treated in other Military Science courses.

MSL 4901. Special Problems. 1-21 Credit Hours.
Permits independent study with a faculty member. Topics and research will pursue areas of military science not extensively treated in any other Military Science class.

MSL 4XXX. Military Sci Elective. 1-21 Credit Hours.

Music (MUSI)

MUSI 1801. Special Topics. 1 Credit Hour.

MUSI 2010. Fundamentals of Musicianship I. 3 Credit Hours.
First semester of integrated sequence in music theory, aural training, music technology, and music literature.

MUSI 2011. Fundamentals of Musicianship II. 3 Credit Hours.
Second semester of integrated sequence in music theory, aural training, music technology, and music literature.

MUSI 2012. Fundamentals of Musicianship III. 3 Credit Hours.
The third semester of integrated sequence in music theory, aural training, music technology, and music literature; focused on advanced theory, history, and technology topics.

MUSI 2013. Fundamentals of Musicianship IV. 3 Credit Hours.
The fourth semester of integrated sequence in music theory, aural training, music technology, and music literature; focused on comprehensive and innovative music discussions.

MUSI 2015. Laptop Orchestra. 3 Credit Hours.
Analysis, rehearsal, creation, and performance of music for laptop orchestra.

MUSI 2525. Introduction Audio Technology I. 3 Credit Hours.
Critical understanding of, and hands-on experience with the fundamentals of analog audio technology. Topics include signals and systems, electro-acoustics, sound effects, synthesis and music protocols.

MUSI 2526. Introduction to Audio Technology II. 3 Credit Hours.
Critical understanding of, and hands-on experience with the fundamentals of digital audio technology. Topics include sampling, quantization, digital effects, music information retrieval and audio coding.

MUSI 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

MUSI 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

MUSI 2700. Introduction to Music Theory. 3 Credit Hours.
Introduction to music theory including basic notation, scales, key signatures, trials, roman numeral analysis, and voice leading in four-part harmony.

MUSI 3018. Marching Band. 2 Credit Hours.
This course will prepare various traditional and contemporary music for scheduled performances throughout the semester in support various athletic events and School of Music concerts.

MUSI 3019. Pep Band. 1 Credit Hour.
This course will prepare a variety of traditional and contemporary music for scheduled performances throughout the semester in support of various athletic events and School of Music concerts.

MUSI 3121. Concert Band. 1 Credit Hour.
An advanced instrumental ensemble performing traditional and contemporary wind literature. Offered to all students with woodwind, brass, or percussion experience. Audition required.

MUSI 3131. Symphonic Band. 1 Credit Hour.
An advanced instrumental ensemble performing traditional and contemporary wind literature. Offered to all students with woodwind, brass, or percussion experience. Audition required.

MUSI 3231. Chamber Choir. 1 Credit Hour.
An auditioned mixed ensemble focused upon the rehearsal, study and performance of choral music. Repertoire varies from various style eras and genres.

MUSI 3241. Chorale. 1 Credit Hour.
A non-auditioned mixed ensemble focused upon the rehearsal, study and performance of choral music. Repertoire varies from various style eras and genres.

MUSI 3251. Glee Club. 1 Credit Hour.
A non-auditioned male ensemble focused upon the rehearsal, study and performance of choral music. Repertoire varies from various style eras and genres.

MUSI 3261. Treble Choir. 1 Credit Hour.
A non-auditioned TREBLE ensemble focused upon the rehearsal, study and performance of choral music. Repertoire varies from various style eras and genres.

MUSI 3311. Jazz Ensemble. 1 Credit Hour.
Jazz Ensemble explores music from the 1920's to the present, focusing on ensemble playing and improvisation.

MUSI 3321. Jazz Combo. 1 Credit Hour.
Jazz Combos explore small group jazz focusing on ensemble playing and improvisation.

MUSI 3411. Chamber Ensemble. 1 Credit Hour.
An advanced ensemble performing traditional and contemporary chamber ensemble literature. Audition and permit required.

MUSI 3450. Survey of Music Technology. 3 Credit Hours.
Creative practices and technical pursuits in the inherently interdisciplinary world of music technology. Hands-on projects which explore key concepts, essential tools, and creative techniques.

MUSI 3511. Percussion Ensemble. 1 Credit Hour.
An advanced instrumental ensemble performing traditional and contemporary percussion literature. Offered to all students with percussion experience. Audition required.

MUSI 3531. New Music Ensemble. 1 Credit Hour.
An advanced instrumental chamber ensemble that performs new and contemporary literature often using technology. Offered to all students with advanced performing experience. Audition required.

MUSI 3541. Electronic Percussion Ensemble. 1 Credit Hour.
An advanced instrumental ensemble performing percussion literature using student designed and built instruments, interfaces and software, as well as commercially available controllers. Offered to all students with percussion experience. Audition required.

MUSI 3551. Rock and Pop Ensemble. 1 Credit Hour.
A contemporary popular music ensemble performing historical and current popular music. Offered to all students with advanced performing experience. Audition required.

MUSI 3611. Symphony Orchestra. 1 Credit Hour.
An advanced instrumental ensemble performing traditional and contemporary literature. Offered to all students with string, woodwind, brass, or percussion experience. Audition required.

MUSI 3621. Musicians & their Music. 3 Credit Hours.
An historical survey of music, including analytical listening and cultural context. No prior experience needed.

MUSI 3630. The History of Jazz, the Roots and Evolution of an American Musical Art Form. 3 Credit Hours.
The history of the American musical art form, Jazz, from its roots within African American work songs through fusion and new directions in jazz.

MUSI 3770. Project Studio: Technology. 4 Credit Hours.
Thematic project in music technology driven by a foundational research question.

MUSI 3771. Project Studio:Analysis. 4 Credit Hours.
Thematic project connecting music theory, musicology, performance practice and musicianship through intensive study of a single musical genre or composer.

MUSI 3801. Special Topics. 1 Credit Hour.
Special ad hoc courses or projects not included in regular course offerings.

MUSI 3802. Special Topics. 2 Credit Hours.
Special ad hoc courses or projects not included in regular course offerings.

MUSI 3803. Special Topics. 3 Credit Hours.
Special ad hoc courses or projects not included in regular course offerings.

MUSI 4450. Integrating Music Into Multimedia. 3 Credit Hours.
Techniques for effectively utilizing music and audio in the context of digital multimedia.

MUSI 4455. Streaming Media. 3 Credit Hours.
To familiarize students with tools and techniques for the creation, production, distribution, and aesthetic analysis of audio, video, and live events for Internet and Internet2 dissemination.

MUSI 4456. Music Technology History and Repertoire. 3 Credit Hours.
Overview of the history, aesthetics, and technology of electronic and computer music over the past century through selected readings, musical analysis, and individual research projects. Credit will not be awarded for both MUSI 4456 and MUSI 6003.

MUSI 4457. Audio Content Analysis. 3 Credit Hours.
The course will survey fundamental techniques in the fast-growing area of Music Information Retrieval (MIR). Credit will not be awarded for both MUSI 4457 and MUSI 6201.

MUSI 4458. Computer Music Composition. 3 Credit Hours.
Realization of individual composition projects in music technology and consideration of related theory, aesthetics, and repertoire. Credit will not be awarded for both MUSI 4458 and MUSI 6304.

MUSI 4459. Digital Signal Processing for Music. 3 Credit Hours.
This course will cover elements of digital audio signal processing, such as spectra, digital filters, Fourier analysis and their application to music synthesis and analysis. Credit will not be awarded for both MUSI 4459 and MUSI 6202.

MUSI 4630. Music Recording and Mixing. 3 Credit Hours.
Overview of concepts, techniques, hardware, and software used in audio production, as well as aesthetic concerns and considerations.

MUSI 4650. Music and Sound Design. 3 Credit Hours.
An investigation of principles and practice of audio and music design, in both contemporary digital and traditional analog systems.

MUSI 4670. Music Interface Design. 3 Credit Hours.
Theory and practice of designing and prototyping new forms of music interfaces, including percussion, haptic, and augmented traditional constructs.

MUSI 4677. Music Perception and Cognition. 3 Credit Hours.
The course will examine how humans process musical sound, covering the basics of the human auditory system and the experience of musical sound. Credit will not be awarded for both MUSI 4677 and MUSI 6001.

MUSI 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

MUSI 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

MUSI 4705. Music Technology Capstone I. 4 Credit Hours.
Students will implement their broad theoretical and practical knowledge and understanding of music technology in a hands-on project, culminating in public presentation.

MUSI 4706. Music Technology Capstone II. 4 Credit Hours.
Students will implement their broad theoretical and practical knowledge and understanding of music technology in a hands on project, culminating in a public and industry presentation.

MUSI 4801. Special Topics. 1 Credit Hour.
Special ad hoc courses or projects not included in regular course offerings.

MUSI 4802. Special Topics. 2 Credit Hours.
Special ad hoc courses or projects not included in regular course offerings.

MUSI 4803. Special Topics. 3 Credit Hours.
Special ad hoc courses or projects not included in regular course offerings.

MUSI 4813. Special Topics. 3 Credit Hours.
Special ad hoc courses or projects not included in regular course offerings.

MUSI 4823. Special Topics. 3 Credit Hours.
Special ad hoc courses or projects included in regular course offerings.

MUSI 4833. Special Topics. 3 Credit Hours.
Special ad hoc courses or projects not included in regular course offerings.

MUSI 4843. Special Topics. 3 Credit Hours.
Special Topics in MUSI.

MUSI 6001. Music Perception and Cognition. 3 Credit Hours.
This course examines how humans process musical sound, including topics such as the auditory system, psychacoustics, music cognition, and psychology.

MUSI 6002. Computer Supported Interactive Music. 3 Credit Hours.
Theoretical and practical issues in computer supported interactive music. The course involves readings, class discussions, student presentations, and the design of a final project.

MUSI 6003. Music Technology History and Repertoire. 3 Credit Hours.
Overview of the history, aesthetics, and technology of electronic and computer music over the past century through selected readings, musical analysis, and individual research projects.

MUSI 6004. Technology Ensemble. 3 Credit Hours.
Practice and performance of original and repertoire works in live audio settings using commercial and propriety technology.

MUSI 6005. Music Ensemble for Graduate Students. 1 Credit Hour.
The graduate level of any music ensemble.

MUSI 6103. Music Recording and Mixing. 3 Credit Hours.
Overview of concepts, techniques, hardware, and software used in audio production as well as aesthetic concerns and considerations.

MUSI 6104. Integrating Music into Multimedia. 3 Credit Hours.
To familiarize students with the tools and techniques for effectively utilizing music and audio in the context of digital multimedia and the internet.

MUSI 6105. Digital Media Production and Mastering. 3 Credit Hours.
Tools and techniques for effectively mastering, optimizing, finalizing, and producing digital media for multimedia and the Internet.

MUSI 6106. Audio Software Engineering. 3 Credit Hours.
Introduction to software engineering for audio-related software projects, covering the main aspects of music software production with a focus on music processing, audio plugin interfaces, and real-time systems.

MUSI 6201. Audio Content Analysis. 3 Credit Hours.
This class addresses theory and techniques of Music Information Retrieval (MIR). Topics include computational analysis of audio signals, symbolic representations, and pattern recognition techniques. Credit will not be awarded for both MUSI 6201 and MUSI 4457.

MUSI 6202. Digital Signal Processing for Music Analysis and Synthesis. 3 Credit Hours.
Research in music, as well as music production and composition increasingly relies on sophiticated digital signal processing techniques. This course will review fundamental elements of digital audio signal processing, such as sinusoids, spectra, digital filters, and Fourier analysis and their application to the fundamental music analysis problems of modeling and synthesis. The course will focus particularly on the algorithmic implementation sound transformation and synthesis techniques through intensive programming assignments in Matlab and CSound.

MUSI 6203. Project Studio in Music Technology. 3 Credit Hours.
Discussion, design and development of computer music applications and performance controllers.

MUSI 6301. Music Interface Design. 3 Credit Hours.
Theory and practice of designing and prototyping new forms of music interfaces including percussion, haptic, and augmented traditional constructs.

MUSI 6304. Computer Music Composition. 3 Credit Hours.
Realization of individual composition projects in music technology and consideration of related theory, aesthetics, and repertoire. Credit will not be awarded for both MUSI 6304 and MUSI 4458.

MUSI 7000. Master's Thesis. 1-21 Credit Hours.
Advisor guided thesis writing.

MUSI 7100. Music Technology Research Laboratory. 1-21 Credit Hours.
Advisor guided research and creative work in music technology. Investigation of novel technological and artistic concepts. Design and develop new hardware, software, and musical artifacts.

MUSI 7998. Preparation for Qualifying Paper. 1-21 Credit Hours.
Preparation of qualifying paper for Ph.D. in Music Technology.

MUSI 7999. Preparation for Qualifying Examination. 1-21 Credit Hours.
Preparation for qualifying examinations for Ph.D. in Music Technology.

MUSI 8001. Research Methods. 3 Credit Hours.
Theoretical and practical issues in music technology research including design patterns, data sets, quantitative and qualitative evaluation standards, proper citation, and print and oral presentation.

MUSI 8002. Apprentice Teaching. 3 Credit Hours.
Pedagogical approaches to music technology, focusing on hands-on teaching experience.

MUSI 8801. Special Topics. 1 Credit Hour.
Topics of current interest.

MUSI 8802. Special Topics. 2 Credit Hours.
Topics of current interest.

MUSI 8803. Special Topics. 3 Credit Hours.
Topics of current interest.

MUSI 8804. Special Topics. 4 Credit Hours.
Topics of current interest.

MUSI 8805. Special Topics. 5 Credit Hours.
Topics of current interest.

MUSI 8901. Special Problems. 1-21 Credit Hours.
individualized study with an advisor.

MUSI 8902. Special Problems. 1-21 Credit Hours.
Individualized study with an advisor.

MUSI 8903. Special Problems. 1-21 Credit Hours.
individualized study with an advisor.

MUSI 8997. Teaching Assistantship. 1-21 Credit Hours.
Independent research conducted under the guidance of a faculty member.

MUSI 8998. Research Assistantship. 1-21 Credit Hours.
Independent research conducted under the guidance of a faculty member.

MUSI 9000. Doctoral Thesis. 1-21 Credit Hours.

Neuroscience (NEUR)

NEUR 1XXX. Neuroscience Elective. 1 Credit Hour.

NEUR 2001. Principles in Neuroscience. 4 Credit Hours.
Students will learn fundamental principles and methods in neuroscience from problem-based study of te neural subtrates of animal behavior.

NEUR 2001R. Introduction to Neuroscience Recitation. 0 Credit Hours.
Recitation for NEUR 2001.

NEUR 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

NEUR 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

NEUR 2901. Special Problems. 1-21 Credit Hours.
Special Problems.

NEUR 2XXX. Neuroscience Elective. 1-21 Credit Hours.

NEUR 3001. Cell and Molecular Neuroscience. 3 Credit Hours.
An overview of principles and techniques in cell and molecular neuroscience: neuron excitability, synaptic transmission, learning and memory to basic mechanisms of neurological diseases.

NEUR 3002. Neural Systems, Networks, and Behavior. 3 Credit Hours.
This course explores how animal behaviors emerge from neuronal networks and systems, with a specific focus on principles of network operation and computational applications.

NEUR 3003. Neuroscience of Behavior. 3 Credit Hours.
This course examines the biological basis of psychology. Behavioral Neuroscience is an interdisciplinary science that aims to investigate the interaction between brain and behavior.

NEUR 3010. Methods in Neuroscience. 3 Credit Hours.
The course is focused on understanding how information about brain and nervous system function can be determined from a wide range of experimental and data analysis techniques.

NEUR 3XXX. Neuroscience Elective. 1-21 Credit Hours.

NEUR 4001. Neuroscience Research Project. 4 Credit Hours.
Focused on multidisciplinary perspectives in neuroscience, this course requires that students utilize and apply the skills and knowledge developed over the course of their major.

NEUR 4100. Neurodevelopment. 3 Credit Hours.
An introduction to the principles of developmental biology of the nervous system, more specifically how neurons and born and connect to one another to form a nervous system.

NEUR 4238. Ion Channels in Health and Disease. 3 Credit Hours.
We will examine the role of ion channels in diverse human diseases and learn basic biophysical properties, structure, normal physiology and pharmacology of ion channels.

NEUR 4300. Neuroscience of Memory. 3 Credit Hours.
How does the nervous system support learning and memory? How does memory guide behavior and decisions? Course emphasizes mammalian brain, but students consider fundamental mechanisms.

NEUR 4400. Neuroendocrinology. 3 Credit Hours.
An introduction to study of the interactions of the nervous and endocrine systems, specifically covering how the brain regulates the hormonal activity in the body.

NEUR 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

NEUR 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

NEUR 4740. Neuroethics. 3 Credit Hours.
This course considers the implications of neuroscience research on culture, society, the legal system, and on how individuals conceive of their nature as human beings.

NEUR 4801. Special Topics. 1 Credit Hour.
Topics of current interest not included in the regular course offerings.

NEUR 4802. Special Topics. 2 Credit Hours.
Topics of current interest not included in the regular course offerings.

NEUR 4803. Special Topics. 3 Credit Hours.
Topics of current interest not included in the regular course offerings.

NEUR 4804. Special Topics. 4 Credit Hours.
Topics of current interest not included in the regular course offerings.

NEUR 4805. Special Topics. 5 Credit Hours.
Topics of current interest not included in the regular course offerings.

NEUR 4806. Special Topics. 6 Credit Hours.
Topics of current interest not included in the regular course offerings.

NEUR 4814. Special Topics. 4 Credit Hours.
Topics of current interest not included in the regular course offerings.

NEUR 4901. Special Problems. 1-21 Credit Hours.
Special Problems.

NEUR 4XXX. Neuroscience Elective. 1 Credit Hour.

NEUR 6001. Principles of Neuroscience and Neurotechnology. 3 Credit Hours.
This course provides an overview of the underlying biological processes that give rise to neural activity.

NEUR 6002. Neurophysiology. 3 Credit Hours.
The course will focus on function and adaptations of muscular and neural systems. Interactions among the various systems and their plasticity will be emphasized.

NEUR 6003. Cognitive Neuroscience. 3 Credit Hours.
This course examines the foundations of Cognitive Neuroscience, including the biological mechanisms underlying cognition, the dominant theories, and the experimental techniques.

NEUR 6XXX. Neuroscience Elective. 1 Credit Hour.

NEUR 9000. Doctoral Research. 1 Credit Hour.
Doctoral research.

Nuclear & Radiological Engr (NRE)

NRE 2120. Elements of Nuclear and Radiological Engineering. 3 Credit Hours.
Introduction to nuclear and radiological engineering concepts and applications.

NRE 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

NRE 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

NRE 3026. Experimental Nuclear Reactor Physics. 3 Credit Hours.
Introduction to experimental nuclear reactor physics techniques including criticality, flux mapping, buckling measurements, subcritical assembly measurements, diffusion length measurement, neutron spectral measurements, and foil activation methods.

NRE 3112. Nuclear Radiation Detection. 3 Credit Hours.
An introduction to the principles and characteristics of basic detectors for nuclear radiation and the pulse processing electronics associated with them.

NRE 3208. Nuclear Reactor Phys I. 3 Credit Hours.
Intermediate treatment of reactor physics and associated advanced mathematics topics.

NRE 3301. Radiation Physics. 3 Credit Hours.
Characteristics of atomic and nuclear radiations, transition probabilities, radioactivity, classical and quantum-mechanical derivations of cross sections, interactions of photon, neutron, and charged particles with matter.

NRE 3316. Radiation Protection Engineering. 3 Credit Hours.
Covers radiation dosimetry, biological effects of radiation, radiation-protection criteria and exposure limits, external radiation protection, internal radiation protection, and sources of human exposure.

NRE 3XXX. Nuclear & Radiological Engineering Elective. 1-21 Credit Hours.

NRE 4210. Nuclear Reactor Theory. 3 Credit Hours.
Students will learn physical nuclear reactor concepts, nuclear data and computational methodology required to understand the design process of nuclear fission reactors.

NRE 4214. Reactor Engineering. 3 Credit Hours.
Nuclear heat generation; fuel elements' thermal analysis; single and two-phase flow and heat transfer in reactor systems; core thermal design and treatment of uncertainties.

NRE 4234. Nuclear Criticality Safety Engineering. 3 Credit Hours.
This course covers the theoretical concepts, the computational techniques, and the principal methods of criticality safety.

NRE 4266. Light Water Reactor Technology. 3 Credit Hours.
A systematic survey of the technology of both pressurized and boiling water reactors with emphasis on the nuclear stream supply system and its associated safety and control systems.

NRE 4328. Radiation Sources and Applications. 3 Credit Hours.
Radiation Sources. Radioisotope production. Application of radiation and radioisotope technology in industry and medicine.

NRE 4350. Design Methods & Tools. 3 Credit Hours.
Introduction to selected methods and nuclear engineering analytic tools (computer codes) with tutorials.

NRE 4351. Design of Nuclear and Radiological Systems. 3 Credit Hours.
NRE Capstone Design course - an open-minded design project, performed by students organized in design teams, that integrates all relevant nuclear and radiological engineering aspects.

NRE 4404. Radiological Assessment and Waste Management. 3 Credit Hours.
Mathematical models for movement in the environment. Scenario development for release, environmental transport, and exposure. Radioactive waste disposal facilities and waste disposal technology.

NRE 4407. Introduction to Radiobiology and Oncology. 3 Credit Hours.
This course will provide the student with a basic knowledge of radiation biology as it pertains to oncology and radiotherapy.

NRE 4430. Nuclear Regulatory Requirements. 2 Credit Hours.
This course introduces regulatory organizations and delineates their jurisdictions. It covers the fundamentals of regulations, the impacts on occupational workers, the public, and the environment.

NRE 4610. Introduction to Plasma Physics and Fusion Engineering. 3 Credit Hours.
A first course in plasma physics and magnetic confinement fusion: basic plasma physics, magnetic confinement concepts, fusion engineering, and a review of the current status of fusion research.

NRE 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

NRE 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

NRE 4725. Probabilistic Risk Assessment. 3 Credit Hours.
Introduction to a wide range of probabilistic risk analysis and probabilistic design methods for mechanical systems. Topics covered are probabilistic description, sampling methods, risk assessment, and reliability-based design.

NRE 4750. Diagnostic Imaging Physics. 3 Credit Hours.
Physics and image formation methods for conventional X-ray CT, nuclear medicine, and magnetic resonance and ultrasound imaging.

NRE 4770. Nuclear Chemical Engineering. 3 Credit Hours.
This course surveys the chemical engineering aspects of nuclear power. Topics include nuclear reactions, fuel cycles, solvent extraction of metals, the properties of actinides and other irradiated fuel materials, fuel reprocessing, and radioactive waste management. Crosslisted with CHE 4770.

NRE 4795. Fundamental Elements of Nuclear Reactor Materials. 3 Credit Hours.
Introduction to fundamentals of nuclear reactor materials. Topics covered are basics of radiation damage, defect creation and evolution, microstructure-property correlations in cladding and fuel of nuclear materials.

NRE 4801. Special Topics. 1 Credit Hour.
Special topic offerings of current interest not included in regular courses.

NRE 4802. Special Topics. 2 Credit Hours.
Special topic offerings of current interest not included in regular courses.

NRE 4803. Special Topics. 3 Credit Hours.
Special topic offerings of current interest not included in regular courses.

NRE 4804. Special Topics. 4 Credit Hours.
Special topics offerings of current interest not included in regular courses.

NRE 4805. Special Topics. 5 Credit Hours.
Special topic offerings of current interest not included in regular courses.

NRE 4901. Special Problems. 1-21 Credit Hours.

NRE 4902. Special Problems. 1-21 Credit Hours.

NRE 4903. Special Problems. 1-21 Credit Hours.

NRE 4XXX. Nuclear & Radiological Engineering Elective. 1-21 Credit Hours.

NRE 6101. Transport Fundamentals. 3 Credit Hours.
Neutral and charged particle transport. Fluid mass, energy, and momentum transport. Models used in nuclear radiation transport; fluid hydrodynamics, radiative and plasma transport.

NRE 6102. Plasma Physics. 3 Credit Hours.
Physics of ionized plasmas. Magnetic confinement, kinetic and fluid theories, equilibrium, waves and stability, plasma-material interactions, atomic/molecular-plasma interactions, multispecies transport. Plasma processing applications.

NRE 6103. Computational Methods of Radiation Transport. 3 Credit Hours.
Deterministic and stochastic computational methods for solving transport equations of neutral particles.

NRE 6201. Reactor Physics. 3 Credit Hours.
Fundamentals of reactor physics for nuclear analysis of neutron chain reactors and for developing tools required for design of those reactors.

NRE 6301. Reactor Engineering. 3 Credit Hours.
Two-phase flow, boiling heat transfer, fast reactor thermal-hydraulics, reactor thermal-hydraulics uncertainty analysis, loss-of-coolant accidents. Reactor thermal- hydraulic accident analysis.

NRE 6401. Advanced Nuclear Engineering Design. 3 Credit Hours.
Synthesis of principles of nuclear engineering in the design of nuclear reactors and other facilities.

NRE 6434. Nuclear Criticality Safety Engineering. 3 Credit Hours.
Concepts, computational techniques, and the principal methods of criticality safety such as accident experience, standards, experiments, computer and hand calculations, limits and regulations. Application to overall facility operation.

NRE 6501. Nuclear Fuel Cycle. 3 Credit Hours.
Fission fuel cycle, uranium mining and milling, enrichment. Fuel fabrication. In-core fuel management. Reprocessing and fuel cycle economics. Spent-fuel waste management.

NRE 6502. Nuclear Materials. 3 Credit Hours.
Materials science and engineering of metallic and ceramic fuels; cladding, structural, and control materials including radiation effects.

NRE 6504. Management of the Nuclear Enterprise. 3 Credit Hours.
Identify and understand the unique challenges of and techniques for managing highly technical, potentially hazardous operations, issues within the nuclear industry.

NRE 6505. Fundamentals of Nuclear Nonproliferation. 3 Credit Hours.
This course explores the fundamentals of nuclear energy generation, pathways of materials misuse, the implication of nuclear technology for international security and policy.

NRE 6720. Seminar: Politics Tech & Proliferation. 3 Credit Hours.
This seminar course is designed specifically to encourage new thinking and creative effort on nuclear deterrence and strategic stability for our global future.

NRE 6755. Radiological Assessment and Waste Management. 3 Credit Hours.
Critical analyses of sources and human exposures, mathematical models for movement through the biosphere, environmental transport, and exposure for nuclear facilities and waste disposal processing. Crosslisted with HP 6755.

NRE 6756. Radiation Physics. 3 Credit Hours.
Characteristics of atomic and nuclear radiation, transition probabilities, radioactivity and isotopes, cross sections, electromagnetic radiation, neutrons, and charged particle interaction with matter. Crosslisted with HP 6756.

NRE 6757. Radiation Detection. 3 Credit Hours.
Introduction to the theory and application of radiation detectors, measurement methods, signal processing, and data analysis. Crosslisted with HP 6757.

NRE 6758. Numerical Methods in Mechanical Engineering. 3 Credit Hours.
Numerical methods for solution of engineering problems; initial, eigenvalue, and boundary-value problems; computational stability for ordinary and linear partial differential equations. Crosslisted with ME and HP 6758.

NRE 6759. Radiation Shielding Principles and Analysis. 3 Credit Hours.
Principles of Radiation Shielding; Design of Shields; Computational Methods for Analysis of Shielding; Emphasis on Monte Carlo Simulation as a Shielding Tool.

NRE 6XXX. Nuclear & Radiological Engineering Elective. 1-21 Credit Hours.

NRE 7000. Master's Thesis. 1-21 Credit Hours.

NRE 7103. Advanced Plasma Physics. 3 Credit Hours.
Classical and collective transport phenomena, plasma instabilities, plasma-materials interactions, and plasma edge physics. Emphasis on magnetic fusion, plasma processing, and other plasma applications research.

NRE 7203. Advanced Reactor Physics. 3 Credit Hours.
Advanced topics in reactor physics and transport theory.

NRE 7757. Teaching Practicum. 3 Credit Hours.
Supervised teaching for doctoral students. Teaching techniques, course and curriculum design, student evaluation methods and criteria. Students may, in some instances, prepare and present lectures. Crosslisted with HP, ME, and CHBE 7757.

NRE 8011. Seminars in Nuclear Engineering. 1 Credit Hour.
Seminars involving current research projects presented by graduate students, faculty, and invited speakers.

NRE 8012. Seminars in Nuclear Engineering. 1 Credit Hour.
Seminars involving current research projects presented by graduate students, faculty, and invited speakers.

NRE 8014. Seminars in Nuclear and Radiological Engineering. 2 Credit Hours.
Seminars involving current research projects presented by graduate students, faculty, and invited speakers.

NRE 8801. Special Topics in Nuclear Engineering. 1 Credit Hour.
Special topic offerings of current interest in nuclear engineering not included in regular courses.

NRE 8802. Special Topics in Nuclear Engineering. 2 Credit Hours.
Special topic offerings of current interest in nuclear engineering not included in regular courses.

NRE 8803. Special Topics in Nuclear Engineering. 3 Credit Hours.
Special topic offerings of current interest in nuclear engineering not included in regular courses.

NRE 8804. Special Topics in Nuclear Engineering. 4 Credit Hours.
Special topic offerings of current interest in nuclear engineering not included in regular courses.

NRE 8805. Special Topics in Nuclear Engineering. 5 Credit Hours.
Special topics offerings of current interest in nuclear engineering not included in regular courses.

NRE 8806. Special Topics in Nuclear Engineering. 6 Credit Hours.
Special topics offerings of current interest in nuclear engineering not included in regular courses.

NRE 8901. Special Problems in Nuclear Engineering. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in nuclear engineering.

NRE 8902. Special Problems in Nuclear Engineering. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in nuclear engineering.

NRE 8903. Special Problems in Nuclear Engineering. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in nuclear engineering.

NRE 8904. Special Problems in Nuclear Engineering. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in nuclear engineering.

NRE 8905. Special Problems in Nuclear Engineering. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in nuclear engineering.

NRE 8906. Special Problems in Nuclear Engineering. 1-21 Credit Hours.
Individual studies and/or experimental investigations of problems of current interest in nuclear engineering.

NRE 8997. Teaching Assistantship. 1-9 Credit Hours.
For graduate students holding graduate teaching assistantships.

NRE 8998. Research Assistantship. 1-9 Credit Hours.
For graduate students holding graduate research assistantships.

NRE 9000. Doctoral Thesis. 1-21 Credit Hours.

Naval Science (NS)

NS 1000. Naval Science Leadership Lab. 1 Credit Hour.
Leadership Laboratory is an engaging and interactive professional development course required every semester for Navy and Marine option Midshipmen in the NROTC program.

NS 1321. Introduction to Naval Sciences. 3 Credit Hours.
This course is an introduction and orientation class designed to give students a broad overview of the roles of the United States Navy and Marine Corps. This course also provides an introduction to the structure, terminology, customs, and uniforms of the Navy and Marine Corps.

NS 1323. Naval Maritime History. 3 Credit Hours.
This course surveys U.S. Naval history from its European origin to the present with emphasis on major developments and the geopolitical forces shaping these developments. The course also covers present day concerns in seapower and maritime affairs, including the economic and political issues of maritime commerce, the law of the sea, and the rise and decline of the Soviet Navy.

NS 2321. Naval Leadership and Management. 3 Credit Hours.
Survey of managerial functions, communication, and major theories of leadership and motivation applied to the Navy organization. Culminates with focus on Naval core values.

NS 2323. Navigation. 3 Credit Hours.
This course develops and broadens the student's understanding of basic piloting and the laws of vessel operations by applying the fundamentals of navigation at sea.

NS 3323. Evolution of Warfare. 3 Credit Hours.
A historical exploration of warfare practiced by great nations. Selected campaigns are studied with emphasis on leadership, evolution of tactics, weaponry, and principles of war.

NS 3324. Marine Weapons and Tactics. 3 Credit Hours.
This course is a prepatory course required by all Marines and Marine Options their junior year prior to Officer Candidates School. General military subjects, land navigation, history, tactics drill, leadership, and physical fitness will be taught and tested.

NS 3325. Naval Weapons Systems. 3 Credit Hours.
This course develops and broadens the student's understanding of basic engineering concepts and principles as applied to naval weapon systems.

NS 3326. Naval Engineering Systems. 3 Credit Hours.
This course develops and broadens the student's understanding of basic engineering concepts and pricples as applied to naval engineering plants.

NS 4320. Naval Operations and Seamanship. 3 Credit Hours.
This course builds on the fundamentals presented in its prerequisites and further prepares soon-to-be-commissioned officers to step aboard their new ship/submarine and stand watch.

NS 4322. Naval Leadership and Ethics. 3 Credit Hours.
Prepares future leaders by exploring and applying a wide range of leadership and ethics tools to enhance objective, sound, and timely decision-making in the most challenging environments. The course integrates an intellectual exploration of Western moral traditions and ethical philosophy with military leadership, core values, professional ethics, and the Uniform Code of Military Justice.

NS 4333. Fundamentals of Maneuver Warfare. 3 Credit Hours.
Broad aspects of warfare and their interactions with manuever warfare doctrine. Focus on the United States Marine Corps as the premier maneuver warfare fighting institution.

Persian (PERS)

PERS 1001. Elementary Persian I. 4 Credit Hours.
Students acquire reading and writing skills and the ability to communicate in basic situations. Taught in Persian.

PERS 1002. Elementary Persian II. 4 Credit Hours.
Students acquire reading and writing skills and the ability to communicate in basic situations. Continuation of PERS 1001. Taught in Persian.

PERS 1801. Special Topics. 1 Credit Hour.
Special Topics - Persian.

PERS 1814. Special Topics. 4 Credit Hours.
Topics of current interest in Persian Languages.

PERS 1824. Special Topics. 4 Credit Hours.
Topics of current interest in Persian Languages.

PERS 2001. Intermediate Persian I. 3 Credit Hours.
Development of grammatical concepts, vocabulary, and conversational abilities. Readings, audio and video material on the culture of Iran. Taught in Persian.

PERS 2002. Intermediate Persian II. 3 Credit Hours.
Continued development of grammatical concepts, vocabulary, and conversational abilities at intermediate level. Readings, audio and video material on the culture of Iran. Taught in Persian.

PERS 2694. Internship Assistantship. 1-21 Credit Hours.
Modern Language Undergraduate Internship for pay for freshmen and sophomores, by permit only. The internship experience must be at a unit or agency approved by the School of Modern Language.

PERS 2695. Undergraduate Internship. 1-21 Credit Hours.
Modern Language Undergraduate Internship for credit for freshmen and sophomores, by permit only. The internship experience must be at a unit or agency approved by the School of Modern Languages.

PERS 2801. Special Topics. 1 Credit Hour.
Special topic class as an intermediate conversation course for students who have completed PERS 2001 or 2002.

PERS 2813. Special Topics. 3 Credit Hours.
Topics of current interest in Persian Languages.

PERS 2823. Special Topics. 3 Credit Hours.
Topics of current interest in Persian Languages.

PERS 3811. Special Topics. 1 Credit Hour.
Topics of current interest in Persian.

PERS 3812. Special Topics. 2 Credit Hours.
Topics of current interest in Persian.

PERS 3813. Special Topics. 3 Credit Hours.
Topics of current interest in Persian Languages.

PERS 3XXX. Persian Elective. 1-21 Credit Hours.

PERS 4001. Modern Iran: Tehran on Screen. 3 Credit Hours.
An exploration of Iranian culture and society through films. Taught in Persian.

PERS 4694. Internship Assistantship. 1-21 Credit Hours.
Modern Language Undergraduate Internship for pay for junior and seniors, by permit only. The internship experience must be at a unit or agency approved by the School of Modern Languages.

PERS 4695. Persian/Farsi Internship. 1-3 Credit Hours.
Professional experience with a business/organization in which students enhance their language skills and cultural knowledge in Persian/Farsi in relation to the practical goals/objectives of the entity.

PERS 4813. Special Topics. 3 Credit Hours.
Topics of current interest in Persian Languages.

PERS 4823. Special Topics. 3 Credit Hours.
Topics of current interest in Persian Languages.

PERS 8803. Special Topics. 3 Credit Hours.
Special Topics - Persian.

PERS 8804. Special Topics. 4 Credit Hours.
Special Topics in Persian Language and Literature.

PERS 8901. Special Problems in Persian. 1-21 Credit Hours.
Provides the special instruction required under special programs.

PERS 8902. Special Problems in Persian. 1-21 Credit Hours.
Provides the special instruction required under special programs.

PERS 8903. Special Problems in Persian. 1-21 Credit Hours.
Provides the special instruction required under special programs.

Philosophy (PHIL)

PHIL 1XXX. Philosophy, Sci& Tech Elec. 1-21 Credit Hours.

PHIL 2010. Introduction to Philosophical Analysis. 3 Credit Hours.
An introduction to the nature of philosophy through the critical analysis of selected works, such as Descartes, Hobbes, and Locke. The relationship of philosophy to science, religion, and culture will be emphasized. Credit not allowed for both PST 1101 and PHIL 2010.

PHIL 2025. Philosophical Analysis of Policy Choices. 3 Credit Hours.
An introduction to philosophical questions that may arise in public policy debate and decision making and to resources from the philosophical tradition for addressing them. Credit not allowed for both PHIL 2025 and PST 2020 or PHIL 2025 and PST 2068.

PHIL 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

PHIL 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

PHIL 2XXX. Philosophy, Sci&Tech Elec. 1-21 Credit Hours.

PHIL 3050. Political Philosophy. 3 Credit Hours.
An exploration of the main currents in political philosophy from antiquity to the present, seeking resources for analyzing contemporary debates about policy and political process. Credit not allowed for both PST 3050 and PHIL 3050.

PHIL 3102. Ancient Philosophy. 3 Credit Hours.
Development of philosophy in the classical works of Ancient Greek philosophy. Credit not allowed for both PHIL 3102 and PST 3102.

PHIL 3103. Modern Philosophy. 3 Credit Hours.
A study of the development of philosophy from the views of Bacon and Descartes to the beginning of the 20th century. Traces the philosophic response to modern science in the rational and empirical traditions. Credit not allowed for both PST 3103 and PHIL 3103.

PHIL 3105. Ethical Theories. 3 Credit Hours.
Surveys traditional ethical theories of value, obligation, and rights and applies these theories to contemporary social problems such as abortion, euthanasia, poverty, and distributional equity, and environmental problems. Credit not allowed for both PHIL 3105 and PST 3105.

PHIL 3109. Engineering Ethics. 3 Credit Hours.
Ethical reasoning in the context of professional work in science and technology. Prepares future technical professionals to approach decision with a coherent ethical framework. Credit not allowed for both PHIL 3109 and PST 3109.

PHIL 3113. Logic and Critical Thinking. 3 Credit Hours.
Symbolic logic and applications of logic in critical reading and thinking by exploring modern systems of symbolic logic and their implications for science. Emphasizes skills in critical thinking and writing based on the principles of logic. Credit not allowed for both PST 3113 and PHIL 3113.

PHIL 3115. Philosophy of Science. 3 Credit Hours.
Examination of the nature and processes of scientific inquiry, including the status of scientific knowledge, identification of pseudoscientific claims, and the role of values in generating and using scientific knowledge. Credit not allowed for both PHIL 3115 and PST 3115.

PHIL 3127. Science, Technology, and Human Values. 3 Credit Hours.
Exploration of the boundaries between science, religion, and social values, examining science and technology in a broader social context. Examines claims that science is isolated from social problems and values. Credit not allowed for both PHIL 3127 and PST 3127.

PHIL 3135. Philosophy of Technology. 3 Credit Hours.
The course considers philosophical accounts of how technologies can and should shape our understandings of politics, ethics, and daily life.

PHIL 3140. Philosophy of Food. 3 Credit Hours.
Examines a range of philosophical and political issues pertaining to the production and consumption of food.

PHIL 3180. Biomedical Ethics. 3 Credit Hours.
A survey of major issues in contemporary biomedical ethics, using well-constructed arguments to understand basic controversies in medicine, research, end-of-life care, and other topics.

PHIL 3790. Introduction to Cognitive Science. 3 Credit Hours.
Multidisciplinary perspectives on cognitive science. Interdisciplinary approaches to issues in cognition, including memory, language, problem solving, learning, perception, and action. Credit not allowed for both PHIL 3790 and PST 3790 (or CS 3790, PSYC 3790, ISYE 3790).

PHIL 3XXX. Philosophy, Sci&Tech Elec. 1-21 Credit Hours.

PHIL 4110. Theories of Knowledge. 3 Credit Hours.
Critical examination of perception, verification, apriori and aposteriori knowledge, meaning and criteria of truth, and cognitive significance of scientific and philosophical propositions. Evolution of epistemology. Credit not allowed for both PHIL 4110 and PST 4110.

PHIL 4174. Perspectives in Science and Technology. 3 Credit Hours.
Comparative analysis of frameworks for interpreting science and technology, discussed in light of case studies. Selected frameworks include philosophical, historical, cognitive, and sociological. Credit not allowed for both PHIL 4174 and PST 4174.

PHIL 4176. Environmental Ethics. 3 Credit Hours.
Conceptual and normative foundations of environmental attitudes and values. Impacts of traditional and modern beliefs that shape human attitudes toward nature on creating a more compatible relationship between humans and their environment. Credit not allowed for both PHIL 4176 and PST 4176.

PHIL 4698. Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

PHIL 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

PHIL 4752. Philosophical Issues in Computation. 3 Credit Hours.
Introduction to metaphysical and epistemological issues in foundations, methods, and implications of computing. Issues include: minds, brains, and machines; representation and language; simulating nature. Credit not allowed for both PHIL 4752 and PST 4752. Crosslisted with CS 4752.

PHIL 4790. Semi-Cognitive Science. 3 Credit Hours.
a seminar-type course in cognitive science focusing on integrating and deepening students' cognitive science knowledge and skills. Topics include memory, language, problem solving, learning, perception, and action. Credit not allowed for both PHIL 4790 and PST 4790 (or CS 4790, PSYC 4790, ISYE 4790).

PHIL 4803. Special Topics. 3 Credit Hours.

PHIL 4811. Special Topics. 1 Credit Hour.
Topics of interest not covered in the regular course offerings.

PHIL 4812. Special Topics. 2 Credit Hours.
Topics of interest not covered in the regular course offerings.

PHIL 4813. Special Topics. 3 Credit Hours.
Topics of interest not covered in the regular course offerings.

PHIL 4814. Special Topics. 4 Credit Hours.
Topics of interest not covered in the regular course offerings.

PHIL 4815. Special Topics. 5 Credit Hours.
Topics of interest not covered in the regular courses offerings.

PHIL 4901. Special Problems. 1-21 Credit Hours.

PHIL 4902. Special Problems. 1-21 Credit Hours.

PHIL 4903. Special Problems. 1-21 Credit Hours.

PHIL 4XXX. Philosophy, Sci&Tech Elec. 1-21 Credit Hours.

PHIL 6000. Responsible Conduct of Research (RCR). 1 Credit Hour.
An introduction to the concepts guiding the responsible conduct of research. Students will learn about the ethical norms and guidelines within different fields of research.

PHIL 6010. Biotechnology and Research Ethics. 2 Credit Hours.
This course focuses on ethical issues in biotechnological fields. The course is designed to satisfy Georgia Tech RCR policy's requirements for "in-person" training.

PHIL 6710. Ethics of Biotechnology and Bioengineering Research. 3 Credit Hours.
This course examines the ethics of biotechnological research, including issues in the realm of research ethics, bioethics, and healthcare robotics.

Physics (PHYS)

PHYS 1000. Physics Orientation. 1 Credit Hour.
Guest lectures will describe career opportunities in physics; the role physicists play in education, government, and industrial laboratories; and programs available to physics majors.

PHYS 11X1. Transfer Non-Calc Phys I. 1-21 Credit Hours.

PHYS 11X2. Transfer Non-Calc PhysII. 1-21 Credit Hours.

PHYS 1XXX. Physics Elective. 1-21 Credit Hours.

PHYS 2001. Physics of Space and Time. 2 Credit Hours.
The development of physics concepts and doctrines from early times to the near future, with social and philosophical correlates.

PHYS 2021. The Solar System. 3 Credit Hours.
This course covers Ancient and Renaissance astronomy, gravity, sky phenomena, telescopes, and the solar system.

PHYS 2022. Stars, Galaxies, and the Universe. 3 Credit Hours.
This course covers optics, telescopes, stellar characteristics and evolution, galaxies, the universe, and the big bang. Physics topics include mechanics, optics, atomic physics, nuclear physics, and relativity.

PHYS 2030. Physics Of Music. 2 Credit Hours.
An introduction to the physical principles underlying the production, transmission, and detection of musical sounds.

PHYS 2211. Introductory Physics I. 4 Credit Hours.
A calculus-based course with a laboratory covering classical mechanics, applications of classical mechanics, oscillations, and waves.

PHYS 2212. Introductory Physics II. 4 Credit Hours.
A calculus-based course with laboratory covering electromagnetism, applications of electromagnetism, light, and modern physics.

PHYS 2213. Introduction to Modern Physics. 3 Credit Hours.
A survey of twentieth century physics. Developments of several branches of physics up to their present frontiers, including historical and philosophical perspectives.

PHYS 2231. Honors Physics I. 5 Credit Hours.
Parallels introductory Physics I (PHYS 2211). Some topics treated in more depth or more extensively. A rigorous physics foundation requiring demonstrated competence in mathematics.

PHYS 2232. Honors Physics II. 5 Credit Hours.
Parallels introductory Physics II (PHYS 2212). Some topics treated in more depth or more extensively. No modern physics content. A rigorous physics foundation requiring demonstrated competence in mathematics.

PHYS 25X1. Transfer Physics I. 4 Credit Hours.

PHYS 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

PHYS 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

PHYS 2750. Physics of the Weather. 3 Credit Hours.
An introductory treatment applying basic physical laws to understanding weather phenomena. Crosslisted with EAS 2750.

PHYS 2801. Special Topics. 1 Credit Hour.
Courses in special topics of current interest in physics are presented from time to time.

PHYS 2802. Special Topics. 2 Credit Hours.
Courses in special topics of current interest in physics are presented from time to time.

PHYS 2803. Special Topics. 3 Credit Hours.
Courses in special topics of current interest in physics are presented from time to time.

PHYS 2804. Special Topics. 4 Credit Hours.
Courses in special topics of current interest in physics are presented from time to time.

PHYS 2814. Special Topics. 4 Credit Hours.
Courses in special topics of current interest in physics.

PHYS 2900. Special Problems. 1-21 Credit Hours.
Course involving special problems in physics are offered from time to time.

PHYS 2901. Special Problems. 1-21 Credit Hours.
Courses involving special problems in physics are offered from time to time.

PHYS 2902. Special Problems. 1-21 Credit Hours.
Courses involving special problems in physics are offered from time to time.

PHYS 2XXX. Physics Elective. 1-21 Credit Hours.

PHYS 3021. Nuclear Astrophysics and Stellar Evolution. 3 Credit Hours.
Develops a working knowledge of stellar and extra-stellar galactic astronomy. Includes stellar structure, nucleosynthesis, stellar evolution, and degenerate objects.

PHYS 3043. Principles of Quantum Mechanics. 3 Credit Hours.
A first introduction to wave mechanics, with emphasis on practical calculations. The rules of quantum mechanics will be illustrated by many working examples.

PHYS 3122. Electrostatics and Magnetostatics. 3 Credit Hours.
First of two courses on the physics of electromagnetism. Topics include Coulomb's Law, Ampere's Law, scalar and vector potentials,Laplace's equation and electric and magnetic fields in matter.

PHYS 3123. Electrodynamics. 3 Credit Hours.
Second of two courses on the physics of electromagnetism. Topics include time-dependent phenomena including Faraday's Law, the Maxwell equations, electromagnetic radiation, and electromagnetic waves.

PHYS 3141. Thermodynamics. 3 Credit Hours.
Introduction to the basic concepts of thermodynamics. Thermodynamic laws will be developed with an emphasis on the macroscopic point of view. Applications of the basic principles will be considered briefly.

PHYS 3143. Quantum Mechanics I. 3 Credit Hours.
First of two courses that develop the principles of quantum mechanics. Topics include the state vector concept. Heisenberg and Schrodinger pictures, uncertainty relations, and exact solvable models in one dimension.

PHYS 3151. Mathematical Physics. 3 Credit Hours.
A review of the mathematical techniques required for the description of physical systems encountered in mechanics, electromagnetism, thermal physics, and quantum mechanics.

PHYS 3201. Classical Mechanics I. 3 Credit Hours.
Dynamics of particles including oscillations and planetary motion, rotation of rigid bodies, and collisions.

PHYS 3202. Classical Mechanics II. 3 Credit Hours.
A continuation of PHYS 3201. Topics include Lagrangians and Hamiltonian techniques, and many body mechanics.

PHYS 3211. Electronics I. 5 Credit Hours.
A first course in both theoretical and applied electronics that is based on a thorough grounding in circuit as well as device physics.

PHYS 3223. Geometrical Optics and Lens Design. 3 Credit Hours.
Principles of geometrical optics using ray tracing techniques. Stops, pupils, aberrations, and photometry. Design and analysis of lenses using current lens design software.

PHYS 3224. Geometrical Optics Laboratory. 2 Credit Hours.
Measurement of parameters of optical surfaces, lenses, and systems using a variety of techniques.

PHYS 3225. Modern Optics. 3 Credit Hours.
Principles of wave propagation, coherence, polarization, diffraction, and Fourier Optics; laser theory including the interaction of light with matter.

PHYS 3226. Modern Optics Laboratory. 2 Credit Hours.
Measurement of parameters of optical surfaces, lenses, and systems using a variety of modern optics techniques.

PHYS 3232. Optics I. 3 Credit Hours.
Optics principles, including waves, reflection, refraction, absorption, scattering, group velocity, lasers, polarization geometrical optics, the Fourier transform, coherence, interference, and diffraction.

PHYS 3250. Principles of the Physics of Living Systems. 4 Credit Hours.
Hands-on lecture/lab undergraduate survey course enabling discovery of principles of Physics of Living Systems across scales.

PHYS 3265. Introduction to Acoustics. 3 Credit Hours.
A course in classical acoustics and applied electroacoustics taught through the palliative of a study of sound reinforcement and reproduction systems.

PHYS 3266. Computational Physics. 4 Credit Hours.
Computer solutions of realistic physics problems such as projectiles in resistive media, electromagnetic sources and fields, atomic scattering, and band pass filters.

PHYS 3801. Special Topics. 1 Credit Hour.
Courses in special topics of current interest in physics are presented from time to time.

PHYS 3802. Special Topics. 2 Credit Hours.
Courses in special topics of current interest in physics are presented from time to time.

PHYS 3803. Special Topics. 3 Credit Hours.
Courses in special topics of current interest in physics are presented from time to time.

PHYS 3804. Special Topics. 4 Credit Hours.
Courses in special topics of current interest in physics are presented from time to time.

PHYS 3806. Special Topics. 2 Credit Hours.
Special Topics.

PHYS 3807. Special Topics. 3 Credit Hours.
Special Topics.

PHYS 3814. Special Topics. 4 Credit Hours.
Special Topics.

PHYS 3900. Special Problems. 1-21 Credit Hours.
Courses involving special problems in physics are offered from time to time.

PHYS 3901. Special Problems. 1-21 Credit Hours.
Courses involving special problems in physics are offered from time to time.

PHYS 3902. Special Problems. 1-21 Credit Hours.
Courses involving special problems in physics are offered from time to time.

PHYS 3XXX. Physics ELective. 1-21 Credit Hours.

PHYS 4142. Statistical Mechanics. 3 Credit Hours.
The statistical basis of thermodynamics is developed. Topics include entropy and the second law, partition functions and free energy, systems of variable particle number, and quantum statistics.

PHYS 4143. Quantum Mechanics II. 3 Credit Hours.
Second of two courses that develop the principles of quantum mechanics. Topics include angular momentum, hydrogen atom, variation methods, perturbation theory, matter-radiation interactions, identical particles.

PHYS 4147. Relativity. 3 Credit Hours.
The course provides an introduction to the special and general theories of relativity that govern gravitational physics including experimental tests, astrophysical applications, black holes and gravitational waves.

PHYS 4206. Electronics II. 5 Credit Hours.
A course in electronic instrumentation with an emphasis on signal processing, both analog and digital, and computer interfacing.

PHYS 4220. Optical Design. 3 Credit Hours.
Principles of optical and optomechanical design including tolerancing, specification, and thermal compensation of systems.

PHYS 4222. Solid-state Devices. 3 Credit Hours.
Course provides an understanding of contemporary research on solid state devices. Topics include band structure, p-n junctions, transistors, superlattices, lasers and detectors, charge coupled devices, and others.

PHYS 4247. Cosmology. 3 Credit Hours.
Modern cosmology of the universe, with the emphasis on the origin and evolution of galaxies and clusters of galaxies, inflation, the cosmic microwave background, dark matter and dark energy.

PHYS 4250. Neurophysics. 4 Credit Hours.
Hands-on lecture/lab undergraduate course connecting theory and experiment to understand principles of neuron, brain, and heart function. Draws upon nonlinear dynamics, basic electrostatics, and electrophysiology.

PHYS 4251. Biophysics. 3 Credit Hours.
Physical principles applied to molecular and cellular biology. Topics include chemiosmosis, self-assembly, protein biosynthesis, and the mechanisms of muscle and nerve function.

PHYS 4261. Atomic Physics. 3 Credit Hours.
Course provides an introduction to the fundamentals of atomic physics, the structure of atoms, and their interaction with static and radiation fields.

PHYS 4262. Solid-state Physics. 3 Credit Hours.
A first course in the physics of crystalline solids. Core topics include crystal lattices, diffraction, bonding, elastic properties, band theory, as well as others.

PHYS 4263. Nuclei, Particles, and Fields. 3 Credit Hours.
An introduction to nuclear and subnuclear systems. Topics include nuclear models, radioactive decay, nuclear reactions, quarks, accelerators, reactors, and stellar nucleosynthesis.

PHYS 4267. Nonlinear Dynamics and Chaos. 3 Credit Hours.
A modern introduction to nonlinear phenomena. Topics include driven oscillators, entrainment, bifurcation, fractals, and control of chaos. Examples are drawn from physical systems.

PHYS 4321. Advanced Laboratory I. 3 Credit Hours.
Experiments are conducted that demonstrate basic principles from various fields of physics. An emphasis is placed on contemporary concepts in modern physics.

PHYS 4322. Advanced Laboratory II. 3 Credit Hours.
A continuation of PHYS 4321. Experiments are conducted that demonstrate basic principles from various fields of physics. An emphasis is placed on contemporary concepts in modern physics.

PHYS 4347. Fundamentals of Astrophysics. 3 Credit Hours.
Theoretical investigation of astrophysical objects and processes, with an emphasis on the interstellar medium, extragalactic astrophysics, gas dynamics, and radiative transfer, and radiation processes.

PHYS 4421. Introduction to Continuum Physics. 3 Credit Hours.
A modern introduction to continuum physics. Topics include elastic theory, dislocations and waves, fluid mechanics and dynamics, and instabilities in fluids.

PHYS 4601. Senior Seminar I. 1 Credit Hour.
Representative research programs in the School are described by advanced graduate students, post-doctoral fellows and faculty members.

PHYS 4602. Senior Seminar II. 1 Credit Hour.
Representative research programs in the school are described by advanced graduate students, post-doctoral fellows, and faculty members.

PHYS 4655. Introductory Diffraction Studies. 4 Credit Hours.
Introductory theory and practice of x-ray and neutron diffraction techniques, including single crystals and powders. Laboratory work is strongly correlated with principles developed in the lectures.

PHYS 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

PHYS 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

PHYS 4740. Estimation and Approximation in Physics. 3 Credit Hours.
Applications of order-of-magnitude estimates, dimensional analysis, scaling arguments, and perturbation theory in different areas of physics.

PHYS 4751. Laser Theory and Applications. 3 Credit Hours.
Provides an introduction to the theory and applications of laser principles and related instrumentation. Emphasis is on the fundamental principles underlying laser action. Crosslisted with ECE 4751.

PHYS 4782. Quantum Information and Quantum Computing. 3 Credit Hours.
Introduction to quantum computing and quantum information theory, formalism of quantum mechanics, quantum gates, algorithms, measurements, coding, and information. Physical realizations and experiments. Crosslisted with MATH 4782.

PHYS 4801. Special Topics. 1 Credit Hour.
Courses in special topics of current interest in physics are presented from time to time.

PHYS 4802. Special Topics. 2 Credit Hours.
Courses in special topics of current interest in physics are presented from time to time.

PHYS 4803. Special Topics. 3 Credit Hours.
Courses in special topics of current interest in physics are presented from time to time.

PHYS 4804. Special Topics. 4 Credit Hours.
Courses in special topics of current interest in physics are presented from time to time.

PHYS 4813. Special Topics. 3 Credit Hours.
Courses in special topics of current interest in physics are presented from time to time.

PHYS 4823. Special Topics. 3 Credit Hours.
Courses in special topics of current interest in physics are presented from time to time.

PHYS 4833. Special Topics. 3 Credit Hours.
Courses in special topics of current interest in physics are presented from time to time.

PHYS 4854. Special Topics. 4 Credit Hours.
Courses in special topics of current interest in physics are presented from time to time.

PHYS 4900. Special Problems. 1-21 Credit Hours.
Courses involving special problems in physics are offered from time to time.

PHYS 4901. Special Problems. 1-21 Credit Hours.
Courses involving special problems in physics are offered from time to time.

PHYS 4902. Special Problems. 1-21 Credit Hours.
Courses involving special problems in physics are offered from time to time.

PHYS 4XXX. Physics Elective. 1-21 Credit Hours.

PHYS 6101. Classical Mechanics I. 3 Credit Hours.
Newtonian mechanics, Hamilton's variational principle, Lagrangian and Hamiltonian mechanics, central forces, rigid body motion, and small oscillations.

PHYS 6103. Electromagnetism I. 3 Credit Hours.
Static and quasistatic phenomena in electromagnetism. Boundary value problems in electrostatics and magnetostatics. Maxwell's equations.

PHYS 6104. Electromagnetism II. 3 Credit Hours.
Theory of generation of electromagnetic waves, their propagation, scattering, and diffraction. Covariant formulation of electrodynamics and application to radiation from charged particles.

PHYS 6105. Quantum Mechanics I. 3 Credit Hours.
An axiomatic development of quantum mechanics. Topics include linear vector spaces, linear operators, infinitesimal transformations, function space, representation and transformation groups.

PHYS 6106. Quantum Mechanics II. 3 Credit Hours.
Applications of quantum mechanics. Topics include systems with spin and angular momentum, atomic structure, time-dependent phenomena, scattering, and various methods of modeling and approximations.

PHYS 6107. Statistical Mechanics I. 3 Credit Hours.
Equilibrium statistical mechanics for closed and open systems. Probability distribution for classical and quantum systems. Partition functions and associated thermodynamical potentials.

PHYS 6124. Mathematical Methods of Physics I. 3 Credit Hours.
First of two courses on mathematical methods used in classical mechanics, electromagnetism, quantum mechanics, and statistical physics. Topics include complex analysis, vectors and matrices, and Sturm-Liouville theory.

PHYS 6203. Solid State Physics. 3 Credit Hours.
A first course in the physics of crystalline solids. Core topics include crystal lattices, diffraction, bonding, elastic properties, band theory, as well as others.

PHYS 6204. Electronics I. 4 Credit Hours.
A first course in both theoretical and applied electronics that is based on a thorough grounding in circuit as well as device physics.

PHYS 6206. Electronics II. 4 Credit Hours.
A course in electronic instrumentation with an emphasis on signal processing, both analog and digital, and computer interfacing.

PHYS 6210. Condensed Matter Physics I. 3 Credit Hours.
Introduction to condensed matter physics. Crystal structure, electronic and thermal properties, response to external electric and magnetic fields.

PHYS 6211. Condensed Matter Physics II. 3 Credit Hours.
Collective and many-electron properties in condensed matter systems. Topics include second quantization, magnetism, phase transitions, and superconductivity.

PHYS 6250. Biophysics. 3 Credit Hours.
Introduction to physical concepts connect to the workings of biological systems at a molecular level. Topics include polymer theory of proteins, diffusion, and bioelectricity.

PHYS 6260. Computational Physics. 3 Credit Hours.
Applications of numerical methods and computer programming to condensed matter; astrophysical hydrodynamics, gravitational physics, black holes and cosmology.

PHYS 6262. Data Science for Physicists. 3 Credit Hours.
Introduction to probability theory, classical statistics and machine learning, and their application to physics.

PHYS 6265. Atomic Physics I. 3 Credit Hours.
This course provides a detailed description of atomic structures and interactions. It contains applications of advanced quantum mechanics to problems in modern atomic physics.

PHYS 6267. Atomic Physics II. 3 Credit Hours.
This course will provide detailed descriptions of non-relativistic atomic/molecular scattering/reaction processes.

PHYS 6268. Nonlinear Dynamics and Chaos. 3 Credit Hours.
A modern introduction to nonlinear phenomena. Topics include driven oscillators, entrainment, bifurcation, fractals, and control of chaos. Examples are drawn from physical systems.

PHYS 6567. Ultrafast Optics. 3 Credit Hours.
A modern introduction to ultrafast optical phenomena. Topics include the generation, amplification, measurement, nonlinear optics, propagation, focusing, shaping and applications of ultrashort laser pulses.

PHYS 6740. Estimation and Approximation in Physics. 3 Credit Hours.
Applications of order-of-magnitude estimates, dimensional analysis, scaling arguments, and perturbation theory in different areas of physics.

PHYS 6750. Foundations of Quantitative Biosciences. 4 Credit Hours.
Introduction to quantitative methods and logic that enable key advances in understanding living systems, spanning molecules, cells, organisms, and biomes.

PHYS 6771. Optoelectronics: Materials, Processes, Devices. 3 Credit Hours.
Optoelectronic materials, physical processes, and devices. Includes compound semiconductor materials, excitation, recombination, gain, and modulation processes, and devices such as emitters, detectors, and modulators. Crosslisted with ECE 6771.

PHYS 6801. Grant Writing and Navigating the Scientific Landscape. 3 Credit Hours.
An introduction to the skills of a professional scientist both within academia and beyond, focusing on preparing grants and proposals, scientific communication and career preparation.

PHYS 6XXX. Physics Elective. 1-21 Credit Hours.

PHYS 7000. Master's Thesis. 1-21 Credit Hours.

PHYS 7123. Statistical Mechanics II. 3 Credit Hours.
Principles of nonequilibrium statistical mechanics, both classical and quantal. Emphasis is on the dynamics of fluctuations, their measurement, and their relationship to transport properties.

PHYS 7125. Introduction to Relativity. 3 Credit Hours.
The theory of gravity, describing how matter curves spacetime and spacetime guides matter, with its experimental and theoretical applications.

PHYS 7127. Cosmology & Galaxies. 3 Credit Hours.
Overview of the relevant physics that govern cosmological processes, and galaxy formation and evolution. Topics include inflation, gravitational collapse, large-scale clustering, and galaxy mergers.

PHYS 7129. High-Energy Astrophysics. 3 Credit Hours.
Introduction to high-energy astrophysical processes and environments, including astrophysical fluid dynamics (e.g., shocks and blast waves), accretion onto compact objects, and clusters of galaxies.

PHYS 7141. Many-Particle Quantum Mechanics. 3 Credit Hours.
Quantum mechanics of interacting Fermi and Bose particles. Topics include second quantization, diagrammatic purturbation theory, variational methods, and path integrals.

PHYS 7143. Group Theory and Quantum Mechanics. 3 Credit Hours.
Foundations of group representation theory with applications in atomic, molecular, nuclear, and solid state physics.

PHYS 7147. Quantum Field Theory. 3 Credit Hours.
Introduction to quantum field theory, with an emphasis in quantum electrodynamics. Second quantization, Dirac equation, Feynman diagrams, quantum electrodynamics, electro-weak interactions.

PHYS 7222. Quantum Optics I. 3 Credit Hours.
Basic course on the interaction of light with matter, based on quantum theory. Applications to the laser and to the study of coherence properties of light.

PHYS 7223. Quantum Optics II. 3 Credit Hours.
Advanced treatment of the interaction of light with matter using modern methods of open quantum systems. Applications to current research.

PHYS 7224. Nonlinear Hamiltonian Dynamics and Chaos. 3 Credit Hours.
A course on nonlinear dissipative dynamical systems, with an emphasis in aspects relevant to physicists. Topics include bifurcation theory, attractors, renormalization group techniques, and pattern formation.

PHYS 7268. Spatio-Temporal Dynamics and Pattern Formation. 3 Credit Hours.
A theoretical description of dynamics and pattern formation in physical, chemical and biological systems driven out of equilibrium. Topics include linear and weakly nonlinear analysis of patterns, bifurcation theory and amplitude equations.

PHYS 7741. Robotics Professional Preparation. 1 Credit Hour.
Preparation for a professional career in Robotics. Local & visiting speakers. Program introduction. Technical resume preparation. GT Robotics labs & resources.

PHYS 7742. Robotics Professional Preparation 2. 1 Credit Hour.
Preparation for a professional career in Robotics. Local & visiting speakers. Selecting and applying for Internship. Developing capstone project proposal. Public speaking practice and preparation.

PHYS 7743. Robotics Professional Preparation 3. 1 Credit Hour.
Preparation for a professional career in Robotics. Local & visiting speakers. Interview preparation & career search. Technical report writing and presentation.

PHYS 8001. Seminar. 1 Credit Hour.
Representative research programs in the School are described by advanced graduate students, post-doctoral fellows, and faculty members. The experimental basis of physics is illustrated through accounts of great experiments of importance to contemporary research.

PHYS 8002. Graduate Student Seminar. 2 Credit Hours.
Representative research programs in the School are described by advanced graduate students, post-doctoral fellows, and faculty members. The experimental basis of physics is illustrated through accounts of great experiments of importance to contemporary research.

PHYS 8740. Robotics Internship. 1-21 Credit Hours.
Graduate Internship at a partner company, GTRI or a GT Robotics lab.

PHYS 8741. Robotics Capstone Project. 3 Credit Hours.
Teams or individuals apply the knowledge and skills acquired throughout the MS program to a faculty supervised robotics project.

PHYS 8801. Special Topics. 1 Credit Hour.

PHYS 8802. Special Topics. 2 Credit Hours.

PHYS 8803. Special Topics. 3 Credit Hours.

PHYS 8804. Special Topics. 4 Credit Hours.

PHYS 8805. Special Topics. 5 Credit Hours.

PHYS 8813. Special Topics. 3 Credit Hours.
Courses in special topics of current interest in physics are presented from time to time.

PHYS 8814. Special Topics. 4 Credit Hours.
Special Topics for Physics (lecture + supervised lab).

PHYS 8823. Special Topics. 3 Credit Hours.
Courses in special topics of current interest in physics are presented from time to time.

PHYS 8833. Special Topics. 3 Credit Hours.
Courses in special topics of current interest in physics are presented from time to time.

PHYS 8901. Special Problems. 1-21 Credit Hours.

PHYS 8991. Master's Practicum. 1-21 Credit Hours.

PHYS 8992. Master's Practicum. 1-21 Credit Hours.

PHYS 8993. Master's Practicum. 1-21 Credit Hours.

PHYS 8997. Teaching Assistantship. 1-9 Credit Hours.
For graduate students holding a graduate teaching assistantship.

PHYS 8998. Research Assistantship. 1-9 Credit Hours.
For graduate students holding a graduate research assistantship.

PHYS 9000. Doctoral Thesis. 1-21 Credit Hours.

Political Science (POL)

POL 1101. Government of the United States. 3 Credit Hours.
The purposes, structure, and functions of national and state governments, focusing on participation, institutions, and the policy process. Foundations of law, civil rights and civil liberties, role of the media, parties and elections, and policy process. Includes study of the Constitution of Georgia. Credit not allowed for both POL 1101 and INTA 1200.

POL 2101. State and Local Government. 3 Credit Hours.
Politics and government processes at the state and local levels.

Psychology (PSYC)

PSYC 1101. General Psychology. 3 Credit Hours.
A survey of methods, findings, and theories of the science of mind and behavior.

PSYC 1XXX. Psychology Elective. 1-21 Credit Hours.

PSYC 2005. Exploring Multicultural Identities. 3 Credit Hours.
This course explores multicultural identities and key multicultural competencies needed to succeed in a global and international society.

PSYC 2012. Introduction to Research Methods. 3 Credit Hours.
Introduction to methods used in conducting research on human behavior. Experimental research emphasized, but course covers other methods and some statistics.

PSYC 2015. Research Methods. 4 Credit Hours.
Introduction to methods used in conducting research on human behavior. Experimental research emphasized, but course covers other methods and some statistics.

PSYC 2020. Psychological Statistics. 4 Credit Hours.
Introduction to probability and statistics as applied to psychological data. Tests for means, variances, correlation, ANVOA, and regression. Credit not allowed for both PSYC 2020 and PSYC 6022.

PSYC 2103. Human Development Over the Life Span. 3 Credit Hours.
Theories and issues in human development including cognitive, social, and emotional development. The course is organized topically rather than chronologically.

PSYC 2130. Introduction to Educational Psychology. 3 Credit Hours.
Introduction to Educational Psychology applies the basic principles of child and adolescent development to the study of teaching and learning.

PSYC 2210. Social Psychology. 3 Credit Hours.
Consideration of the behavior of individuals in social contexts, including interpersonal and group settings.

PSYC 2220. Industrial/Organizational Psychology. 3 Credit Hours.
An introduction to industrial/organizational psychology providing an overview of behavior in the workplace and psychology applied in industrial and organizational settings.

PSYC 2230. Abnormal Psychology. 3 Credit Hours.
This course surveys the spectrum of psychiatric disorders (symptoms, epidemiology, etiology, and treatment) and provides a perspective on adaptive functioning and psychological resilience.

PSYC 2240. Personality Theory. 3 Credit Hours.
Introduction to major approaches to personality theory.

PSYC 2250. Cross-Cultural Psychology. 3 Credit Hours.
This course provides students with an opportunity to learn about the similarities and differences in human behavior across cultures.

PSYC 2270. Introduction to Engineering Psychology. 3 Credit Hours.
Engineering psychology presented as an integral component in the design and evaluation of human-machine systems. Applied problems and general methodological questions are examined.

PSYC 2280. Psychology of Creativity and Art. 3 Credit Hours.
Evolutionary theories of art production and consumption; the psychology of aesthetics; psychological correlates of creative and artistic behavior.

PSYC 2595. Internship. 1-21 Credit Hours.
Psychology Undergraduate Internship for credit for freshman or sophomores, by permit only. The internship experience must be at a unit or agency approved by the School of Psychology.

PSYC 2695. Internship. 1-21 Credit Hours.
Psychology Undergraduate Internship for credit for freshman or sophomores, by permit only. The internship experience must be at a unit or agency approved by the School of Psychology.

PSYC 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of the faculty member.

PSYC 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

PSYC 2760. Human Language Processing. 3 Credit Hours.
Theories and research in psychlinguistics: how people comprehend and speak human languages. Includes speech perception, word recognition, parsing, sentence interpretation, word production, and sentence generation. Crosslisted with LING 2760.

PSYC 2801. Special Topics. 1 Credit Hour.
Special topics of current interest.

PSYC 2802. Special Topics. 2 Credit Hours.
Special topics of current interest.

PSYC 2803. Special Topics. 3 Credit Hours.
Special topics of current interest.

PSYC 2901. Special Problems. 1-21 Credit Hours.
Special problems of current interest.

PSYC 2902. Special Problems. 1-21 Credit Hours.
Special problems of current interest.

PSYC 2903. Special Problems. 1-21 Credit Hours.
Special problems of current interest.

PSYC 2XXX. Psychology Elective. 1-21 Credit Hours.

PSYC 3000. Science of Stress, Anxiety, and Happiness. 3 Credit Hours.
This course will cover the psychological and neuroscientific mechanisms underlying happiness and its relation to subjective health and well-being.

PSYC 3005. Mindfulness: Science and Practice. 3 Credit Hours.
This experiential course is an introduction to mindfulness where students will study the theory of mind-body awareness and apply principles to daily life.

PSYC 3009. Health Psychology. 3 Credit Hours.
This course is designed to provide a broad overview of the psychological influences on health and illness in our society.

PSYC 3011. Cognitive Psychology. 4 Credit Hours.
Exploration of the central aspects of human cognition including pattern recognition, attention, memory, language, categorization, problem solving, and decision making; phenomena and methods are stressed. Credit not allowed for both PSYC 3011 and PSYC 3012.

PSYC 3012. Introduction to Cognitive Psychology. 3 Credit Hours.
Examines the foundations of Cognitive Psychology including methods, analysis techniques and psychological theories involved in perception, attention, memory, problem solving, decision making, and language. Credit not allowed for both PSYC 3012 and PSYC 3011.

PSYC 3020. Biopsychology. 3 Credit Hours.
Neurophysiological, endocrinological, and biochemical bases of sensory and motor functioning, motivation, learning, memory, and behavior dysfunction.

PSYC 3031. Experimental Analysis of Behavior. 4 Credit Hours.
History, theory, and methods of behavior analysis. Topics include shaping, stimulus-stimulus and response-consequence contingencies, stimulus control, and choice.

PSYC 3040. Sensation and Perception. 3 Credit Hours.
An examination of how sensations and perceptions are processed by humans. Topics covered will include vision, hearing, the skin senses, taste, smell, and the vestibular senses.

PSYC 3041. Human Sensation and Perception. 4 Credit Hours.
An examination of human sensory systems and perceptual processes. For Psychology majors only.

PSYC 3750. Human Computer Interface Design and Evaluation. 3 Credit Hours.
Human computer interface is considered in terms of user-system compatibility. Concepts in human factors and interface design are covered in relation to capabilities of both humans and computers. Crosslisted with CS 3750.

PSYC 3751. Introduction to User Interface Design. 3 Credit Hours.
Describes the characteristics of interaction between humans and computers and demonstrates techniques for the design and evaluation of user interfaces and computational systems.

PSYC 3790. Introduction to Cognitive Science. 3 Credit Hours.
Multidisciplinary perspectives on cognitive science. Interdisciplinary approaches to issues in cognition, including memory, language, problem solving, learning, perception, and action. Crosslisted with CS, PST, and ISYE 3790.

PSYC 3803. Special Topics. 3 Credit Hours.
Special Topics.

PSYC 3873. Special Topics. 3 Credit Hours.
Special Topics in Psychology.

PSYC 3XXX. Psychology Elective. 1-21 Credit Hours.

PSYC 4010. Human Abilities. 3 Credit Hours.
Introduction to differential psychology providing an overview of differences in humans. Topics such as abilities, temperament, and group differences (e.g., gender) are addressed.

PSYC 4011. Cognitive Psychology. 4 Credit Hours.
Exploration of the central aspects of human cognition including pattern recognition, attention, memory, language, categorization, problem solving, and decision making; phenomena and methods are stressed. Credit will not be awarded for both PSYC 4011 and PSYC 3011.

PSYC 4020. Biopsychology. 3 Credit Hours.
Neurophysiological, endocrinological, and biochemical bases of sensory and motor functioning, motivation, learning, memory, and behavior dysfunction. Credit will not be awarded for both PSYC 4020 and PSYC 3020.

PSYC 4025. Learning and Memory. 3 Credit Hours.
Research and applications concerning acqusition of new behavior and knowledge, including accounts based on classical and instrumental conditioning and information-processing models of memory and learning.

PSYC 4031. Applied Experimental Psychology. 4 Credit Hours.
Consideration of the applications of methods and data of experimental psychology. Understanding of human capabilities and limitations is applied to design of technology and environments.

PSYC 4041. Human Sensation and Perception. 4 Credit Hours.
An examination of human sensory systems and perceptual processes. Credit will not be awarded for both PSYC 4041 and PSYC 3041.

PSYC 4050. History and Systems. 3 Credit Hours.
A survey of the history, methods, and content of modern psychological theory, research, and application. Schools of psychology (e.g., structuralism, functionalism, behaviorism, gestalt psychology) and central theories of psychology will be reviewed in their historical and philosophical context.

PSYC 4090. Cognitive Neuroscience. 3 Credit Hours.
Examination of the neural basis of cognitive function. Basic anatomy and methods are covered. Primary focus is on contemporary problems in the neurocognitive study of perception, memory, language, and attention, as well as disorders in these domains.

PSYC 4100. Behavioral Pharmacology. 3 Credit Hours.
An analysis of drug-behavior interactions with emphasis on basic pharmacology, role of contingencies in drug effects, mechanisms of drug dependency, drugs as stimuli, and basic neuropharmacology.

PSYC 4200. Advanced Topics in Cognitive Psychology. 3 Credit Hours.
An advanced survey in various topics in cognitive psychology. Topics will vary over time.

PSYC 4260. Psychology of Aging. 3 Credit Hours.
Survey of research concerned with the nature and causes of adult age differences in behavior.

PSYC 4270. Psychological Testing. 3 Credit Hours.
Fundamentals of psychological test construction (reliability and validity) and applications of intelligence, personality, and interest assessment. Topics will include theoretical, practical, ethical, and legal issues.

PSYC 4600. Senior Thesis I. 3 Credit Hours.
The first of a two course sequence in which selected students conduct original work under the direction of a faculty member. The student will produce a proposal for research that will be undertaken during the second course (PSYC 4601).

PSYC 4601. Senior Thesis II. 4 Credit Hours.
The second of a two course sequence in which selected students conduct original work under the direction of a faculty member.

PSYC 4695. Internship. 1-21 Credit Hours.
Psychology Undergraduate Internship for credit for juniors and seniors, by permit only. The internship experience must be at a unit or agency approved by the School of Psychology.

PSYC 4696. Undergraduate Teaching Assistantship. 0 Credit Hours.
Psychology teaching assistantship for pay under the guidance of a faculty member. Permit only. Note: This course cannot count toward Psychology Electives or Free Electives.

PSYC 4697. Psychology Undergraduate Teaching Experience. 3 Credit Hours.
An introduction to teaching biology for undergraduate teaching assistants, with a focus on effective teaching, active engagement of students, and development of innovative classroom activities.

PSYC 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

PSYC 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

PSYC 4740. Neuroethics. 3 Credit Hours.
This course considers the implications of neuroscience research on culture, society, the legal system, and on how individuals conceive of their nature as human beings.

PSYC 4770. Psychology and Environmental Design. 3 Credit Hours.
Introduction of psychological concepts relevant to environmental design. Survey of selected methods for assessing human-made environments and development of design solutions to selected problems. Crosslisted with ARCH 4770.

PSYC 4790. Seminar in Cognitive Science. 3 Credit Hours.
A seminar-type course in cognitive science focusing on integrating and deepening students' cognitive science knowledge and skills. Topics include memory, language, problem solving, learning, perception, and action. Crosslisted with CS, PST, and ISYE 4790.

PSYC 4791. Integrative Project in Cognitive Science. 3 Credit Hours.
An integrative course in cognitive science focusing on the integration and use of concepts and skills from cognitive science. A different integrative project or set of projects will be taken on each semester; students will contribute on the basis of their background and skills. Crosslisted with CS, ISYE, and PST 4791.

PSYC 4792. Design Project in Cognitive Science. 3 Credit Hours.
Individual project with a cognitive science faculty member, designed as a supplement to the student's senior design project or thesis in their major area. Crosslisted with CS, ISYE, and PST 4792.

PSYC 4803. Special Topics. 3 Credit Hours.
Special topics or courses of an experimental nature.

PSYC 4813. Special Topics. 3 Credit Hours.
Special topics or courses of an experimental nature.

PSYC 4823. Special Topics. 3 Credit Hours.
Special topics or courses of an experimental nature.

PSYC 4833. Special Topics. 3 Credit Hours.
Special topics or courses of an experimental nature,

PSYC 4873. Special Topics. 3 Credit Hours.

PSYC 4900. Special Problems. 1-21 Credit Hours.
Students engage in individual and group projects under the direction of a faculty member.

PSYC 4901. Special Problems. 1-21 Credit Hours.
Students engage in individual and group projects under the direction of a faculty member.

PSYC 4902. Special Problems. 1-21 Credit Hours.
Students engage in individual and group projects under the direction of a faculty member.

PSYC 4903. Special Problems. 1-21 Credit Hours.
Students engage in individual and group projects under the direction of a faculty member.

PSYC 4904. Special Problems. 1-21 Credit Hours.
Students engage in individual and group projects under the direction of a faculty member.

PSYC 4905. Special Problems. 1-21 Credit Hours.
Students engage in individual and group projects under the direction of a faculty member.

PSYC 4906. Special Problems. 1-21 Credit Hours.
Students engage in individual and group projects under the direction of a faculty member.

PSYC 4907. Special Problems. 1-21 Credit Hours.
Students engage in individual and group projects under the direction of a faculty member.

PSYC 4908. Special Problems. 1-21 Credit Hours.
Students engage in individual and group projects under the direction of a faculty member.

PSYC 4909. Special Problems. 1-21 Credit Hours.
Students engage in individual and group projects under the direction of a faculty member.

PSYC 4910. Special Problems. 1-21 Credit Hours.
Students engage in individual and group projects under the direction of a faculty member.

PSYC 4XXX. Psychology Elective. 1-21 Credit Hours.

PSYC 6000. Responsible Conduct of Research (RCR). 1 Credit Hour.
Topics include research misconduct, data management, use of animal and human subjects, conflicts of interest and commitment, authorship, publication, peer review , and collaboration and mentoring.

PSYC 6011. Cognitive Psychology. 3 Credit Hours.
Survey course on human cognition including pattern recognition, attention, memory, categorization, problem solving, consciousness, decision making, intention, and the relation between mind and brain.

PSYC 6012. Social Psychology. 3 Credit Hours.
Fundamental theory and research in social behavior including social perception/cognition, attitude formation and change, social influences, and group processes.

PSYC 6013. Biopsychology. 3 Credit Hours.
Neurophysiological, endocrinological, and biochemical bases of sensory and motor functioning, motivation, learning, memory, and behavior dysfunction.

PSYC 6014. Sensation and Perception. 3 Credit Hours.
This course examines how sensations and perceptions of the outside world are processed by humans, including physiological, psychophysical, ecological, and computational perspectives.

PSYC 6015. Developmental Psychology. 3 Credit Hours.
Overview of concepts, assumptions, methods, theories, and research in human development across the life span including cognitive, emotional, and social behavior.

PSYC 6016. Experimental Analysis of Behavior. 3 Credit Hours.
Conceptual, methodological, and theoretical issues in the experimental analysis of behavior with special emphasis on classical and operant conditioning as foundations for complex behavior.

PSYC 6017. Human Abilities. 3 Credit Hours.
Theory, methods, and applications of research on human abilities, including intelligence, aptitude, achievement, learning, aptitude treatment interactions, information processing correlates, and measurement issues.

PSYC 6018. Principles of Research Design. 3 Credit Hours.
Introduction to basic principles and practices of empirical research in psychology. Covers both experimental and correlational methods and designs.

PSYC 6019. Statistical Analysis of Psychological Data I. 5 Credit Hours.
Introductory treatment of descriptive and inferential statistics as applied to psychological research.

PSYC 6020. Statistical Analysis of Psychological Data II. 5 Credit Hours.
Introductory treatment of inferential statistics, especially the general linear model, as applied to psychological research.

PSYC 6021. Personality Theories. 3 Credit Hours.
Survey of personality theories, research, and methods of assessment.

PSYC 6022. Psychological Statistics for HCI. 4 Credit Hours.
Introduction to statistical methods as applied to psychological data within the HCI domain. Credit not allowed for both PSYC 6022 and PSYC 2020.

PSYC 6023. Psychological Research Methods for HCI. 4 Credit Hours.
Introduction to psychological research methods within the HCI domain. Credit not allowed for both PSYC 6023 and PSYC 2020.

PSYC 6031. Engineering Psychology: Analysis Techniques. 2 Credit Hours.
This course covers the basic analysis techniques used to investigate human-machine systems and human performance.

PSYC 6032. Engineering Psychology: Environmental Stressors and Performance. 1 Credit Hour.
This course covers environmental stressors and their influence on human performance. Emphasis will be placed onnoise, lighting, micro-gravity and atmospheric conditions.

PSYC 6033. Engineering Psyc: Cognitive Ergonomics. 1 Credit Hour.
This course applies the research findings from cognitive psychology to the design of products and systems that involve people.

PSYC 6034. Engineering Psyc: Displays. 1 Credit Hour.
This course covers the basic human factors principles involved in display formatting.

PSYC 6035. Engineering Psyc: Controls and Workspace. 1 Credit Hour.
This course covers the basic human factors principles involved in controls and workspace layout.

PSYC 6040. Current Topics in Cognition and Brain Sciences. 1 Credit Hour.
This course presents current research topics in cognition and brain science.

PSYC 6041. Current Topics in Cognitive Aging. 1 Credit Hour.
This course presents current research topics in cognitive aging.

PSYC 6042. Neuroimaging: From Image to Inference. 3 Credit Hours.
This course details the potential and limits of fMRI and critically evaluates the inferences that can be drawn from fMRI studies.

PSYC 6043. Engineering Psychology Research Seminar. 1 Credit Hour.
This course presents current research topics in engineering psychology.

PSYC 6060. Psychology of Aging. 3 Credit Hours.
A survey covering psychological aspects of aging, mind, and behavior (perception, cognition, emotion, mental health) and topics relevant to adulthood (e.g. caregiving and retirement).

PSYC 6090. Cognitive Neuroscience. 3 Credit Hours.
Examines the foundations of Cognitive Neuroscience, including the biological mechanisms underlying cognition, the dominant theories, and the experimental techniques.

PSYC 6270. Psychological Testing. 3 Credit Hours.
Fundamentals of psychological testing. Topics include test construction and application issues.

PSYC 6750. Human-Computer Interface. 3 Credit Hours.
Describes the characteristics of interaction between humans and computers and demonstrates techniques for the evaluation of user-centered systems. Crosslisted with CS 6750.

PSYC 6753. Human-Computer Interaction-Professional Preparation and Practice. 1 Credit Hour.
Preparation for a professional career in HCI. Hands-on workshops in resume and portfolio building, interviewing, public speaking, team work. HCI career choices and trajectories.

PSYC 6755. Human-Computer Interaction Foundations. 3 Credit Hours.
Describes the theory and practice of designing effective and efficient interactions between people and technology.

PSYC 6795. Introduction to Cognitive Science. 3 Credit Hours.
Multidisciplinary perspectives on cognitive science. Interdisciplinary approaches to issues in cognition, including memory, language, problem solving, learning, perception, and action. Crosslisted with CS and ISYE 6795.

PSYC 6998. HCI Master's Project. 1-9 Credit Hours.
Final project for students completing a Human-Computer Interaction master's degree. Repeatable for multi-semester projects.

PSYC 6XXX. Psychology Elective. 1-21 Credit Hours.

PSYC 7000. Master's Thesis. 1-21 Credit Hours.

PSYC 7020. Survey of Cognitive Aging. 3 Credit Hours.
Introduction to theory and research on adult cognitive development, including intelligence, attention, memory, and problem solving.

PSYC 7101. Engineering Psychology I: Methods. 3 Credit Hours.
Basic methods used to study human-machine systems including both system analysis and human performance evaluation techniques. These methods will be applied to specific systems.

PSYC 7102. Engineering Psychology II: Displays, Controls, and Workspace. 3 Credit Hours.
Basic principles of human factors for the design, evaluation, and use of displays, controls, and workspace layouts including new technologies and associated human factors problems.

PSYC 7103. Engineering Psychology III: Environmental Stressors and Human Performance. 3 Credit Hours.
Environmental stressors and their influences on human performance, physiological function, and emotional responses including work/rest cycles, jetlag, noise, vibration, glare, weightlessness, etc.

PSYC 7104. Psychomotor and Cognitive Skill Learning and Performance. 3 Credit Hours.
Human capabilities and limitations for learning and performing psychomotor and cognitive skills are studied.

PSYC 7105. First-year Research Project I. 3 Credit Hours.
First year graduate students will initiate a research project.

PSYC 7106. First-year Research Project II. 3 Credit Hours.
First year graduate students will complete a research project.

PSYC 7201. Industrial/Organizational Psychology. 3 Credit Hours.
This course introduces an overview of issues relevant to behavior in the workplace and psychology applied in industrial and organizational settings.

PSYC 7202. Employee Selection. 3 Credit Hours.
The course provides a conceptual framework for personnel selection guided by scientific principles, research, and theory as well as by professional, legal, and technical guidelines.

PSYC 7203. Motivation and Job Attitudes. 3 Credit Hours.
Examines theory and pragmatics in description, prediction, and measurement of work-related behavior and associated evaluations. Includes theoretical and methodological problems in field and laboratory contexts.

PSYC 7204. Training and Development. 3 Credit Hours.
This course will focus on theory, principles, techniques, and practices relevant to training and developing human resources. Research and professional literature will be examined.

PSYC 7301. Introduction to Multivariate Statistics. 3 Credit Hours.
Foundations for multivariate analysis including properties of linear composite variables, multiple regression, multiple and partial correlation, MANOVA, factor analysis, multiple discriminant analysis, canonical correlation, etc.

PSYC 7302. Structural Equation Modeling. 3 Credit Hours.
Methods of causal modeling to study causal relations including issues of causality, establishing causality, fundamentals of linear structural equation modeling with latent variables, fitting models.

PSYC 7303. Psychometric Theory. 3 Credit Hours.
Preparation of students in statistical theory and techniques relevant to becoming professionally involved in construction, analysis, and evaluation of psychology and personnel tests.

PSYC 7700. Professional Problems. 2 Credit Hours.
Discussion of issues faced by professional psychologists in the areas of teaching, research, and professional practice. Ethical issues in all of these areas are emphasized.

PSYC 7701. Teaching Practicum. 2 Credit Hours.
Supervised college teaching including techniques, course and curriculum design, evaluation. Students will prepare and present lectures with direct observations and video taping for discussion.

PSYC 7790. Cognitive Modeling. 4 Credit Hours.
A hands-on course covering a range of cognitive modeling methodologies. It explores the analysis, development, construction, and evaluation of models of cognitive processing. Crosslisted with CS and ISYE 7790.

PSYC 7999. Preparation for Doctoral Qualifying Exam. 1-21 Credit Hours.

PSYC 8000. Seminar in Experimental Psychology. 3 Credit Hours.
Critical examination of current problems in a selected area of general experimental psychology. Areas to be discussed may vary each time course is offered.

PSYC 8010. Seminar in Cognitive Psychology. 3 Credit Hours.
Critical examination of current problems in a selected area of cognitive psychology. Areas to be discussed may vary each time course is offered.

PSYC 8020. Seminar in Cognitive Aging. 3 Credit Hours.
Critical examination of current problems in a selected area of cognitive aging. Areas to be discussed may vary each time course is offered.

PSYC 8030. Seminar in Comparative Psychology. 3 Credit Hours.
Critical examination of current problems in a selected area of comparative psychology. Areas to be discussed may vary each time course is offered.

PSYC 8040. Seminar in Engineering Psychology. 3 Credit Hours.
Critical examination of current problems in a selected area of engineering psychology. Areas to be discussed may vary each time course is offered.

PSYC 8050. Seminar in Industrial/Organizational Psychology. 3 Credit Hours.
Critical examination of current problems in a selected area of industrial/organizational psychology. Areas to be discussed may vary each time course is offered.

PSYC 8060. Seminar in Quantitative Psychology. 3 Credit Hours.
Presentation and discussion of quantitative approaches to psychology. Topics will vary, but might include neural networks, measurement theory, behavioral ecology, modeling, system dynamics, etc.

PSYC 8070. Seminar in Cognitive Neuroscience. 3 Credit Hours.
Critical examination of current problems in selected areas of cognitive neuroscience. Areas to be discussed vary each time.

PSYC 8080. Seminar in Cognition and Brain Science. 3 Credit Hours.
Critical examination of current problems in selected areas of cognition and brain sciences. Areas to be discussed may vary each time.

PSYC 8795. Colloquium in Cognitive Science. 1 Credit Hour.
Reading of research papers by leading cognitive scientists, attendance at their colloquia, and meeting with them to discuss research. Crosslisted with CS and ISYE 8795.

PSYC 8802. Topics in CogNeuro. 2 Credit Hours.
Covers current issues and recent advances in cognitive neuroscience.

PSYC 8803. Special Topics in Applied Statistics. 3 Credit Hours.
Covers current issues and recent advances in the application of statistical methods to research in psychology. Instructors select the specific focus for a given term.

PSYC 8804. Special Topics in Cognitive Aging. 3 Credit Hours.
Covers current issues and recent advances in cognitive aging.

PSYC 8805. Special Topics in Cognitive Neuroscience. 3 Credit Hours.
Covers current issues and recent advances in cognitive neuroscience.

PSYC 8806. Special Topics in Cognitive Psychology. 3 Credit Hours.
Covers current issues and recent advances in cognitive psychology.

PSYC 8807. Special Topics in Engineering Psychology. 3 Credit Hours.
Covers current issues and recent advances in Engineering Psychology.

PSYC 8811. Special Topics. 1 Credit Hour.
Special topics that cover current issues and recent advances in Psychology.

PSYC 8812. Special Topics. 2 Credit Hours.
Special topics that cover current issues and recent advances in Psychology.

PSYC 8890. Special Topics in Cognitive Science. 3 Credit Hours.

PSYC 8900. Special Problems in Experimental Psychology. 1-21 Credit Hours.
Students conduct research under direction of a faculty member on problems in the general area of experimental psychology.

PSYC 8901. Special Problems in Engineering Psychology. 1-21 Credit Hours.
Students conduct research under the direction of a faculty member on problems in the general area of engineering psychology.

PSYC 8902. Special Problems in Industrial/Organizational Psychology. 1-21 Credit Hours.
Students conduct research under the direction of a faculty member on problems investigating some psychological aspect of industrial/organizational problems.

PSYC 8903. Special Problems in Human-Computer Interaction. 1-21 Credit Hours.
Students conduct research under the direction of a faculty member on problems in the general area of human-computer interaction.

PSYC 8904. Special Problems in Cognitive Aging. 1-21 Credit Hours.
Students conduct research under the direction of a faculty member on problems in cognitive aging.

PSYC 8905. Special Problems in Cognitive Neuroscience. 1-21 Credit Hours.
Students conduct research under the direction of a faculty member on problems in cognitive neuroscience.

PSYC 8906. Special Problems in Cognitive Psychology. 1-21 Credit Hours.
Students conduct research under the direction of a faculty member on problems in cognitive psychology.

PSYC 8907. Special Problems in Cognition & Brain Science. 1-21 Credit Hours.
Students conduct research under the direction of a faculty member on problems in cognition and brain sciences.

PSYC 8908. Special Problems in Quantitative Psychology. 1-21 Credit Hours.
Students conduct research under the direction of a faculty member on problems in quantitative psychology.

PSYC 8997. Teaching Assistantship. 1-9 Credit Hours.
For graduate students holding a teaching assistantship.

PSYC 8998. Research Assistantship. 1-9 Credit Hours.
For graduate students holding a research assistantship.

PSYC 9000. Doctoral Thesis. 1-21 Credit Hours.

Polymer, Textile and Fiber Eng (PTFE)

PTFE 9000. Doctoral Thesis. 1-21 Credit Hours.

Public Policy/Joint GSU PhD (PUBJ)

PUBJ 8000. Joint Doctoral Program with Georgia State university. 1-21 Credit Hours.
Placeholder course for students in the joint Doctoral program in Public Policy with Georgia State University as their home institution. Used to maintain Georgia Tech student status.

PUBJ 8801. Special Topics-Joint Program with Georgia State University. 1 Credit Hour.

PUBJ 8802. Special Topics-Joint Program with Georgia State University. 2 Credit Hours.

PUBJ 8803. Special Topics-Joint Program with Georgia State University. 3 Credit Hours.

PUBJ 8811. Special Topics-Joint Program with Georgia State University. 1 Credit Hour.

PUBJ 8812. Special Topics-Joint Program with Georgia State University. 2 Credit Hours.

PUBJ 8813. Special Topics-Joint Program with Georgia State University. 3 Credit Hours.

PUBJ 8821. Special Topics-Joint Program with Georgia State University. 1 Credit Hour.

PUBJ 8822. Special Topics-Joint Program with Georgia State University. 2 Credit Hours.

PUBJ 8823. Special Topics-Joint Program with Georgia State University. 3 Credit Hours.

Public Policy (PUBP)

PUBP 1142. Teams and Collaboration. 3 Credit Hours.
Exposes students to essential theories and concepts for analyzing, understanding, and managing teams in the context of complex interdependent public problems. Credit not awarded for both PUBP 1142 and PUBP 2142.

PUBP 1XXX. Public Policy Elective. 1-21 Credit Hours.

PUBP 2010. Political Processes. 3 Credit Hours.
Introduction to political models and theories of policy making. Agenda-setting, stakeholder involvement, policy adoption, policy design and implementation, evaluation, and advocacy.

PUBP 2012. Foundations of Public Policy. 3 Credit Hours.
An in-depth exploration of American public policy, with emphasis on the dynamics of policymaking in policy areas such as health care, research, energy and environment, income maintenance, and economic development.

PUBP 2030. Organizations and Policy. 3 Credit Hours.
An exploration of the roles and activities of bureaucracies in the implementation of policies and programs, with emphasis on practical issues of public management. Credit not allowed for both PUBP 2030 and PUBP 3010.

PUBP 2142. Teams and Collaboration in Context. 3 Credit Hours.
Exposes students to essential theories and concepts for analyzing, understanding, and managing teams in the context of complex interdependent public problems. Credit not awarded for both PUBP 2142 and PUBP 1142.

PUBP 2651. Public Policy Internship. 1-3 Credit Hours.
Course projects related to professional internships. Topics, credit, and requirements to be arranged by student, instructor, and sponsor. Maybe taken only once.

PUBP 2694. Intern Assistantship. 1-21 Credit Hours.
Undergraduate Internship for Public Policy for pay.

PUBP 2695. Undergraduate Internship. 1-21 Credit Hours.
Undergraduate Internship for Public Policy for academic credit.

PUBP 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

PUBP 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

PUBP 2803. Special Topics. 3 Credit Hours.
Courses on special topics of current interest in Public Policy.

PUBP 2XXX. Public Policy Elective. 1-21 Credit Hours.

PUBP 3000. American Constitutional Issues. 3 Credit Hours.
Examines the American social and political system through the prism of Constitutional issues decided by the U.S. Supreme Court. Includes study of the Constitution of Georgia.

PUBP 3016. Judicial Process. 3 Credit Hours.
The functions, structures, and procedures of state and federal court systems, including selection and appointment of judges, judicial activism, influences on court decisions, and enforcement of court decisions.

PUBP 3020. Applied Political Economy. 3 Credit Hours.
Roles of markets and government in allocating resources. Rational choice approaches to understanding policy. Institutional design. Growth and sustainability.

PUBP 3030. Policy Analysis. 3 Credit Hours.
The science and craft of professional problem-solving, analysis, and advice. Economic and political approaches and techniques for analysis of costs, benefits, and risks.

PUBP 3042. Data Science for Public Policy. 3 Credit Hours.
Introduces fundamentals of data science, tools, and quantitative methodologies and ethical implications for public and social applications. Topics for policy applications vary by semester.

PUBP 3120. Statistical Analysis for Public Policy. 3 Credit Hours.
Introduction to probability, descriptive statistics, inferential statistics and analysis, and spreadsheets. Emphasis application of basic statistical concepts to public policy and administration problems. Credit not allowed for both PUBP 3120 and PUBP 4113.

PUBP 3130. Research Methods and Problem Solving. 3 Credit Hours.
Conceptual and methodological issues in policy studies, including causality, explanation, models, threats to research, data collection, and assessment of applicability to policy issues. Design of research. Credit not allowed for both PUBP 3130 and PUBP 3110.

PUBP 3141. Leading Social Organizations. 3 Credit Hours.
This course is designed to give the student a sound understanding of how to lead and manage change in social organizations.

PUBP 3201. Introduction to Social Policy. 3 Credit Hours.
A survey of public policies directed toward social problems in America and their evolution and reform. Development of role of government in addressing issues related to poverty and social welfare.

PUBP 3210. U.S. Health Policy. 3 Credit Hours.
Evolution of major US health care institutions and related policies and politics; their purposes, effects, and relationships; and recent and possible health policy reforms.

PUBP 3214. African American Politics. 3 Credit Hours.
An exploration of the organizations, strategies, and issues that have defined African American political life in the post-civil rights era in the United States.

PUBP 3230. STEM Education Policy. 3 Credit Hours.
A seminar exploring the role of public policy in shaping the conduct of STEM (science, technology, engineering, and mathematics) education in the United States.

PUBP 3244. Stem Cell Science, Policy, and Ethics. 3 Credit Hours.
Examination of current state of scientific knowledge regarding stem cells and historical development, relevant ethical issues, and policy considerations.

PUBP 3315. Environmental Policy and Politics. 3 Credit Hours.
Overview of the major institutions, organizations, official and unofficial actors in environmental policy and politics, and what influences their environmental decisions and actions. Credit not allowed for both PUBP 3315 and PUBP 4314.

PUBP 3320. Climate Policy. 3 Credit Hours.
Examines relevant scientific theory and evidence, political history, policy options, alternative policy analysis frameworks, and the influence of science and scientific uncertainity on climate policy.

PUBP 3350. Energy Policy. 3 Credit Hours.
Examines policies impacting the production and utilization of energy in the U.S. and abroad. Addresses resource constraints, physical principles, and policy analysis tools and concepts.

PUBP 3502. Information and Communications Technology Policy. 3 Credit Hours.
Examination of the convergence of information technology, communications and telecommunications, policymaking within the executive/regulatory branches, special interest group role, and key domestic and international issues. Credit not allowed for both PUBP 3502 and PUBP 4512.

PUBP 3510. Politics and Policy. 3 Credit Hours.
Application of political science and other social science concepts and theories to current issues. Investigates several current topics in detail.

PUBP 3520. Globalization and Public Policy. 3 Credit Hours.
This course will serve as an introduction to the fundamental concepts, theories, conflicts, and issues of globalization and its effects on public policy.

PUBP 3600. Sustainability, Technology, and Policy. 3 Credit Hours.
Ethical, scientific, technological, economic, and political dimensions of sustainable human practices, applying multidisciplinary perspectives to challenges facing public and private-sector approaches to sustainability.

PUBP 3610. Pre-Law Seminar. 3 Credit Hours.
Examination of the legal profession and areas of legal specialization (e.g., contract, property, intellectual property, international). Emphasizes skills and values that are essential to success in law school and competent lawyering.

PUBP 3XXX. Public Policy Elective. 1-21 Credit Hours.

PUBP 4010. Policy Task Force I. 3 Credit Hours.
Capstone project in which teams of students formulate, analyze, and recommend policy options.

PUBP 4020. Policy Task Force II. 3 Credit Hours.
Capstone project in which teams of students formulate, analyze, and recommend policy options.

PUBP 4111. Internet and Public Policy. 3 Credit Hours.
Analyzes policy implications of Internet architecture (Internet protocols, domain name system, packet switching, peer-to-peer) and surveys policy issues about content, privacy, intellectual property, and governance.

PUBP 4120. Survey Research Methods. 3 Credit Hours.
Methods for producing and reporting valid surveys, including composition of questions, design and implementation of survey strategies, and analysis and communication of results.

PUBP 4130. Policy Analysis and Program Evaluation. 3 Credit Hours.
Analytical methods for rational planning and policy analysis, emphasizing "learning by doing" as students examine alternative types of policy analysis, establish evaluation criteria, and evaluate policy implementation.

PUBP 4140. Foundations of Leadership. 3 Credit Hours.
This course offers a comprehensive review of contemporary issues and perspectives on leadership, including multi-disciplinary and systems-oriented approaches as well as classic theory, moving to the examination of evolving contemporary beliefs.

PUBP 4200. Social Policy Issues. 3 Credit Hours.
A review of conceptual and analytical perspectives in social policy and coverage of major areas of persistent social problems, including health care, welfare reform, housing, education, reproductive issues, and gerontology.

PUBP 4211. Urban Policy. 3 Credit Hours.
Urban policy and urban economic development examined historically, nationally, and locally. Approaches to urban development and redevelopment.

PUBP 4212. Women and Public Policy. 3 Credit Hours.
The status of women in American society as a function of rights and opportunities conferred upon women by governmental actions and as influenced by forces of social change.

PUBP 4214. Gender, Science, Technology, and Public Policy. 3 Credit Hours.
The course focuses on the connections between gender, science, and technology, and issuues of public policy.

PUBP 4226. Business and Government. 3 Credit Hours.
How government regulates business and markets, and how business exercises power and influence on government in areas such as antitrust, financial markets, safety and health, and environmental quality.

PUBP 4260. Economic Development Policy and Planning. 3 Credit Hours.
Introduction to the context, theory, processes, and practice of regional and local economic development policy and planning in the U.S. and internationally.

PUBP 4338. Environmental Impact Assessment. 3 Credit Hours.
Examines policy, planning, and methodological issues in the environmental impact assessment of engineering systems. Emphasizes regulatory aspects of environmental analysis and key analytical techniques, and the incorporation of environmental considerations into engineering design processes.

PUBP 4410. Science, Technology, and Public Policy. 3 Credit Hours.
Examination of relationships between science, technology, and government, and their mutual influence on public and private decisions.

PUBP 4414. Technology, Innovation, and Policy. 3 Credit Hours.
Theories and concepts of technological innovation and diffusion, economic development, and the role of public and private institutions in technological development at the firm, industry, regional, national, and international levels.

PUBP 4416. Critical Issues in Science and Technology. 3 Credit Hours.
Exploration of technology and technological society, going beyond utility and functionality to consider justice, meaningfulness, and self-realization. Perspectives include political economy, aesthetics, and social change.

PUBP 4440. Science, Technology, and Regulation. 3 Credit Hours.
Examines historical, legal, economic, and political rationales for regulation. Survey of administrative law and processes, risk analysis/management, expertise and public, and current topical issues. Credit not allowed for both PUBP 4440 and PUBP 6440.

PUBP 4501. Info Policy & Management. 3 Credit Hours.
An introduction to the role of information and knowledge in modern private and public organizations. It covers theoretical and practical aspects of information seeking, gathering and use in organizations as well as knowledge creation and its role in private and public management. Credit not awarded for both PUBP 4501 and PUBP 6501.

PUBP 4514. Mass Communication Policy. 3 Credit Hours.
Examines mass media influences, activities, characteristics, and behavior with respect to the political process and government. Structure of media markets, characteristics of news and advertising, and impacts of changing technologies on political processes.

PUBP 4530. Introduction to Geographic Information Systems. 3 Credit Hours.
Overview of GIS concepts, methods, and terminology, Introduction to PC-based GIS software. Applications to marketing, natural resource management, and public information systems. Students use case studies to design and implement actual projects.

PUBP 4532. Advanced GIS Topics: Spatial Analysis, GIS Programming, and Map Internet Server. 3 Credit Hours.
Introduction to raster-based GIS software, Avenue script language, and map Internet server. Applications to marketing, natural resource management, and public information systems.

PUBP 4600. Senior Seminar/Thesis. 3 Credit Hours.
A capstone course usually taken in the student's last term before graduation, the senior seminar and thesis involves writing an original paper entailing policy analysis relevant to a public or nonprofit agency.

PUBP 4609. Legal Practice. 3 Credit Hours.
This course develops skills in reading and comprehension of legal materials, analysis of legal writing, and document drafting in selected areas of law.

PUBP 4620. Environmental Law. 3 Credit Hours.
Investigation of the principal environmental laws and regulations. The class will also consider philosophical and ethical underpinnings of environmental law.

PUBP 4630. Law, Medicine, and Ethics. 3 Credit Hours.
This course will examine common ethical dilemmas and challenges in medicine, methods for thinking ethically, and how the law responds to these situations.

PUBP 4640. Technology Law, Policy, and Management. 3 Credit Hours.
An in-depth analysis of patent law and survey of other forms of intellectual property protection, including trademark, copyright, and trade secrets.

PUBP 4650. Internet Law. 3 Credit Hours.
Covers issues including copyright (including music/video file sharing), privacy; freedom of speech (including defamation and obscenity), jurisdiction, regulation, and crimes as applied to the Internet.

PUBP 4651. Public Policy Internship. 1-6 Credit Hours.
Course projects related to professional internships. Topics, credit, and requirements to be arranged by student, instructor, and sponsor.

PUBP 4652. OLA Legal Internship. 1-3 Credit Hours.
Supervised professional internship with the Georgia Tech Office of Legal Affairs.

PUBP 4694. Intern Assistantship. 1-21 Credit Hours.
Undergraduate Internship for Public Policy for pay.

PUBP 4695. Undergraduate Internship. 1-21 Credit Hours.
Undergraduate Internship for Public Policy for academic credit.

PUBP 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

PUBP 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

PUBP 4725. Information Security Policies and Strategies. 3 Credit Hours.
Information security vulnerabilities and risks; legal, cost, privacy, and technology constraints; derivation of strategies; technical and procedural means of achieving desired ends. Credit not awarded for both PUBP 4725 and PUBP 6725/CS/MGT 4725/6725.

PUBP 4726. Privacy, Technology, Policy and Law. 3 Credit Hours.
This course takes a multi-disciplinary approach to privacy, a topic of great interest in the technology, policy, ethics and law business realms. Credit will not be awarded for more than one of PUBP 4726, MGT 4726, MGT 6726, CS 4726 OR CS 6726.

PUBP 4756. Technology Forecasting and Assessment. 3 Credit Hours.
Develops skills in methods for technology monitoring, forecasting, and assessment; draws on examples in various emerging technologies. Collection and analysis of quantitative and qualitative data on emerging technologies and their implications. Crosslisted with ISYE 4756.

PUBP 4803. Special Topics. 3 Credit Hours.

PUBP 4811. Special Topics. 1 Credit Hour.
Topics of interest not covered in the regular course offerings.

PUBP 4812. Special Topics. 2 Credit Hours.
Topics of interest not covered in the regular course offerings.

PUBP 4813. Special Topics. 3 Credit Hours.
Topics of interest not covered in the regular course offerings.

PUBP 4814. Special Topics. 4 Credit Hours.
Topics of interest not covered in the regular course offerings.

PUBP 4815. Special Topics. 5 Credit Hours.
Topics of interest not covered in the regular course offerings.

PUBP 4823. Special Topics. 3 Credit Hours.
Topics of interest not covered in the regular offerings.

PUBP 4833. Special Topics. 3 Credit Hours.
Topics of interest not covered in the regular offerings.

PUBP 4843. Special Topics. 3 Credit Hours.
Topics of interest not covered in the regular offerings.

PUBP 4901. Special Problems. 1-21 Credit Hours.

PUBP 4902. Special Problems. 1-21 Credit Hours.

PUBP 4903. Special Problems. 1-21 Credit Hours.

PUBP 4951. Georgia Internship Program. 3 Credit Hours.
Work-study program assigning students to a project in state or local government. Students prepare research papers analyzing their work experiences relative to theory from the social science or policy studies.

PUBP 4952. Legislative Internship Program. 3 Credit Hours.
Students work fulltime for the Georgia General Assembly for elected officials or committees. Students prepare research papers analyzing their work experiences relative to theory from the social science or policy studies. Spring semester only.

PUBP 4XXX. Public Policy Elective. 1-21 Credit Hours.

PUBP 6001. Introduction to Public Policy. 1 Credit Hour.
An introduction to the field of public policy, including an overview of the scope of the field and examples of public policy analysis.

PUBP 6010. Ethics, Epistemology, and Public Policy. 3 Credit Hours.
Examination of the role of ethics and epistemology in public decision making including the effects of values of professionals on public institutions and private sector organizations.

PUBP 6012. Fundamentals of Policy Processes. 3 Credit Hours.
The political and governmental context of policy is presented, from agenda setting to evaluation. Examines constitutional and federal contexts of policy, the role of various input mechanisms in shaping policy decisions, the processes by which government institutions make decisions (and the interactions among these institutions), and approaches for understanding and anticipating policy decision making.

PUBP 6014. Organization Theory. 3 Credit Hours.
A broad overview of the theoretical issues pertaining to the management of organizations. The course explores both "macro" (i.e. external relations, strategies, and structures) organizational issues. While this is a survey course, we will be concentrating much of our attention on current challenges to bureaucracy as a form of organization. In particular, we will be using theories to examine trends toward re-engineering corporations or re-inventing government agencies. Satisfies policy implementation, management, and organization theory requirement.

PUBP 6017. Public Management. 3 Credit Hours.
Using case studies and a field exercise, students will examine how public policies are executed and managed. Underlying the course is the assumption that public management, is the management of political authority and that strategic thinking can make for effective public management. Satisfies policy implementation, management and organization theory requirement.

PUBP 6018. Policy Implementation and Administration. 3 Credit Hours.
This course gives special attention to institutional processes in efforts to coordinate policy implementation at the federal level and within the intergovernmental context; the analysis of implementation and enforcement of policy by regulatory agencies with the support of state governments and private sector agents; challenges to implementation by policy type; and the analysis of policy tools and administrative discretion in implementation. Satisfies policy implementation, management, and organization theory requirement.

PUBP 6111. Internet and Public Policy. 3 Credit Hours.
Analyzes policy implications of Internet architecture (Internet protocols, domain name system, packet switching, peer-to-peer) and surveys policy issues about content, privacy, intellectual property, and governance.

PUBP 6112. Research Design in Policy Science. 3 Credit Hours.
The objectives for this course include: (1) providing a broad overview of research methods and research criteria; (2) giving students the opportunity to conduct data-based research and analysis; (3) providing more specialized knowledge of one set of research techniques (e.g. survey research, case studies, experimentation - varies by term); (4) providing experience in presenting and defending research.

PUBP 6114. Applied Policy Methods and Data Analysis. 3 Credit Hours.
Development of the ability to extract meaning from multivariate data sets configured in formats amenable to statistical analysis in social science and policy analysis. This course introduces multivariate data collection, production, description, management and presentation for public policy; multivariate probability distributions; inferential statistics with multivariate data sets; graphical methods for multivariate data analysis; and the use of statistical programming languages.

PUBP 6116. Microeconomics for Policy Analysis. 3 Credit Hours.
Microeconomic theory is studied with applications to public problems. Students will be introduced to price-generating processes in an economy, demand and supply theory, market equilibrium, welfare economics, categories of market failure, and the public sector's role.

PUBP 6118. Public Finance Policy. 3 Credit Hours.
Examines the theory, practice and policy implementations of federal, state, and local government budgeting and finance. Topics include government spending decisions with a focus on aggregate demand and supply, fiscal policy, budgeting practice, introduction to cost/benefit analysis.

PUBP 6120. Cost Benefit Analysis for Policy. 3 Credit Hours.
This course introduces Cost-Benefit Analysis theory and methods. Governments and other regulators can use Cost-Benefit analysis to increase the efficiency of public policy.

PUBP 6201. Public Policy Analysis. 3 Credit Hours.
This course provides a capstone experience for public policy students. The course addresses real-world policy issues and various approaches to analyzing them. The course relies heavily on cases and exercises.

PUBP 6218. Quantitative Models in Public Policy. 3 Credit Hours.
This course lays a foundation for model building, and through the introduction of a variety of software packages will provide some hands-on experience with elementary model- building. Decision models will be emphasized. Some familiarity with data analysis, probability, and statistical models is assumed. The goal of the course is to equip students with basic model building tools, familiarize them with common problems in modeling, and improve their ability to create and evaluate simple models of policy problems.

PUBP 6221. Policy and Program Evaluation. 3 Credit Hours.
Approaches to evaluation policies and programs are presented using examples and case studies to contrast evaluation methods as well as the organizational and political context for evaluation.

PUBP 6226. Business and Government. 3 Credit Hours.
Examines government regulation of business operations and the economy from a broad perspective.

PUBP 6300. Earth Systems. 3 Credit Hours.
Describes the scientific principles and interactions that make up the Earth's environmental system. The course examines the interaction of natural and human influences that shape the development and operation of the Earth system and how public and private decision-making impacts this system.

PUBP 6310. Environmental Issues. 3 Credit Hours.
Provides an overview of basic concepts and methods of environmental policy analysis and implementation through a case study approach. Cases will range from local to global environmental policy issues. The goal of the course will be to expose students to the broad range of social and physical problems referred to as "environmental" problems, and to orient the student for future work in the field.

PUBP 6312. Economics of Environmental Policy. 3 Credit Hours.
This course addresses key concepts in environmental economics, including externalities, efficiency, social welfare and environmental quality as a public good. Addresses environmental problems (i.e. water resources, air quality, urbanization) and vehicles of collective environmental action.

PUBP 6314. Policy Tools for Environmental Management. 3 Credit Hours.
Explores the various regulatory, managerial, and legal mechanisms available to policy analysts and decision makers for protecting environmental quality.

PUBP 6326. Environmental Values and Policy Goals. 3 Credit Hours.
Examines the goals and objectives of environmentalists, with special attention to the literature of environmental ethics.

PUBP 6327. Sustainability and Environmental Policy. 3 Credit Hours.
This course explores the theory and practice of sustainable development, surveying areas of consensus and controversy in emerging thought on sustainability. Credit not allowed for both PUBP 6327 and PUBP 6320.

PUBP 6330. Environmental Law. 3 Credit Hours.
Presents the legal and institutional framework within which environmental law is developed and implemented in the in the United States and internationally. Also examines the major pollution control statutes, and reviews international law and conventions to address trans-boundary environmental issues.

PUBP 6350. Energy Policy & Markets. 3 Credit Hours.
Examines theory and policy impacting production and utilization of energy in the U.S. and abroad. Addresses resource constraints, environmental impacts, and policy analysis tools.

PUBP 6352. Utility Regulation and Policy. 3 Credit Hours.
Covers regulation of energy and water systems, including environmental laws, rate setting, purchase obligations, and policies influencing consumers, including solar systems and efficiency.

PUBP 6354. Climate Policy. 3 Credit Hours.
Examines relevant scientific theory, the history of international negotiation and institutional, economic and technological alternatives to reduce emissions sources and/or adapt to climate change impacts.

PUBP 6360. Sustainable Energy & Environmental Management. 3 Credit Hours.
The course introduces the theory and philosophy of sustainability and how that theory is implemented through the public and private sectors.

PUBP 6401. Science, Technology, and Public Policy. 3 Credit Hours.
Examination of the relationships between science, technology, and government, including policies for support, control, and application of science and technology.

PUBP 6402. Research Policy and Management. 3 Credit Hours.
Examines challenges in research policy and management. The research activities of public, private, and not-for-profit organizations are contrasted in examining strategic planning, allocation of resources, technology transfer, and research evaluation practices.

PUBP 6403. Scientific Careers and Workplaces. 3 Credit Hours.
Focuses on key social and organizational dimensions of scientific careers and workplace sectors (academia, industry, and government).

PUBP 6414. Technological Innovation and Government Policy. 3 Credit Hours.
Federal and state policies to stimulate innovation; sources and stimuli for innovation; role of universities and industry consortia; comparative innovation policy; evaluation of technology policy.

PUBP 6415. Technology, Regions, and Policy. 3 Credit Hours.
Explores concepts, issues, and policies related to regional development, economic development, industrial change, and technology policy.

PUBP 6417. Critical Perspectives on Science and Technology. 3 Credit Hours.
This course seeks to stimulate students' critical thinking about science and technology and their relationships to markets, politics and societies. Discussions include topics such as the social organization of scientific and technical communities, the roles of economic and political forces in science and technology, the shaping of the technical workforce, and the implications of science and technology for concepts that go beyond utility and competitiveness to include justice and self-realization.

PUBP 6421. Development of Large-scale Socio-technical Systems. 3 Credit Hours.
Analyzes development of large systems such as smart highways, computer networks, electrical power, weapons, and space. Teaches practical skills including negotiation, coalition-building, strategy, and innovation politics.

PUBP 6440. Science, Technology, and Regulation. 3 Credit Hours.
Examines historical, legal, economic, and political rationales for regulation. Survey of administrative law and processes, risk analysis/management, expertise and public, and current topical issues. Credit not allowed for both PUBP 6440 and PUBP 4440.

PUBP 6501. Information Policy and Management. 3 Credit Hours.
An introduction to the role of information and knowledge in modern private and public organizations. It covers theoretical and practical aspects of information seeking, gathering and use in organizations as well as knowledge creation and its role in private and public management. Credit not awarded for both PUBP 6501 and PUBP 4501.

PUBP 6502. Information and Communications Technology Policy. 3 Credit Hours.
Examination of the convergence of information technology, communications and telecommunication, policymaking within the executive/regulatory branches, special interest group role, and key domestic and international issues.

PUBP 6514. Mass Communications Policy. 3 Credit Hours.
Traces the evolution of broadcasting, cable, and other mass media policies. Examines the functioning/impact of mass communications in a changing technological environment.

PUBP 6521. Globalization & Policy. 3 Credit Hours.
This course will serve as an introduction to the fundamental concepts, theories, conflicts, and issues of globalization and its effects on public policy.

PUBP 6530. Introduction to Geographic Information Systems. 3 Credit Hours.
Introduction to the application of geographic information systems (GIS) to public policy issues. Students develop an understanding of GIS software and hardware components, develop facility with a desktop GIS software package, explore digital data availability on the Internet, learn data transfer procedures, learn cartographic projection methods, apply GIS and environmental management data to analyze a selected program.

PUBP 6600. Foundations of Local Economic Development Planning and Policy. 3 Credit Hours.
Introduction to the context, theory, process, and practice of local economic development planning and policy. Topics covered include: differing theoretical and conceptual explanations of the economic development process; international, national, and regional factors affecting local economic development; federal, state, and local roles; key elements in the economic development process; and contrasting economic development approaches.

PUBP 6602. Economic Development Analysis and Practice. 3 Credit Hours.
Strategy development, methods of analysis, and approaches to practice for urban and regional economic development policy and planning.

PUBP 6604. Methods of Urban Policy Analysis and Planning. 3 Credit Hours.
Applies analytical techniques and practices of public policy and planning to urban issues, synthesizing varied public policy techniques and practices in a case study context.

PUBP 6606. Urban Development Policy. 3 Credit Hours.
Introduces elements of urban policy and urban economic development by examining them historically, nationally, and locally. Approaches to urban development and redevelopment are analyzed.

PUBP 6701. Energy Technology Policy. 3 Credit Hours.
Examines energy production, use, and policy using quantitative engineering and policy analysis. Addresses resource constraints, physical principles, and policy analysis methods.

PUBP 6725. Information Security Policies and Strategies. 3 Credit Hours.
Information security vulnerabilities and risks; legal, cost, privacy and technology constraints; derivation of strategies; technical and procedural means of achieving desired ends. Credit not awarded for both PUBP 6725 and PUBP 4725/CS/MGT 4725/6725.

PUBP 6726. Privacy, Technology, Policy, and Law. 3 Credit Hours.
This course takes a multi-disciplinary approach to privacy, a topic of great interest in the technology, policy, ethics, law, and business realms. Credit will not be awarded for more than one of PUB 6726, MGT 6726 or CS 6726.

PUBP 6727. Cyber Security Practicum. 5 Credit Hours.
Capstone independent study project placing each student in a commercial, academic or government setting where he or she identifies a major cyber security problem, and explores and evaluates a solution that addresses it with realistic assumptions about the organizational context. The chose problem must be approved by course instructor. Cross-listed with ECE and CS 6727.

PUBP 6740. Innovation, the State and Industrial Development in International Perspecitve. 3 Credit Hours.
Research seminar exploring the role of the state in industrial development, innovation and business-government relations. Special attention given to science and technology policies and their influence in different international and industrial contexts. Crosslisted with INTA 6740.

PUBP 6741. Geography of Innovation. 3 Credit Hours.
Examination of the growing discussion on the knowledge economy, learning regions, innovation capacity, and place management and what those strategies mean for regional economies.

PUBP 6743. Science, Technology & Society: Core Seminar. 3 Credit Hours.
This survey course covers key works in Science, Technology & Society, and guest lectures introduce students to faculty doing STS-related research across the Ivan Allen College. Credit not allowed for both PUBP 6743 and HTS 6743 or LCC 6743.

PUBP 6748. Social Justice, Critical Theory, and Philosophy of Design. 3 Credit Hours.
Focuses on social justice from a Science, Technology, and Society (STS) point of view that is informed by critical theory and philosophy of design. Credit not allowed for both PUBP 6748 and LCC 6748.

PUBP 6749. Feminist Theory and Science and Technology Studies. 3 Credit Hours.
This course is an advanced science, technology and society (STS) seminar in feminist theory. Credit not allowed for both PUBP 6749 and LCC 6749.

PUBP 6753. Comparative Science and Technology Policy. 3 Credit Hours.
Examination of the social, political, and cultural contexts of science and technology, and how they affect the research, development, and regulatory policies of nations. Crosslisted with INTA 6753.

PUBP 6760. Negotiation and Conflict Management. 3 Credit Hours.
Practical and theoretical instruction on techniques of negotiation and consensus building using training exercises and case studies. Emphasizes environmental, policy, planning, and development disputes. Crosslisted with CP 6760.

PUBP 6777. Analysis of Emerging Technologies. 3 Credit Hours.
This course develops skills in the use of selected methods for technology monitoring, forecasting, and assessment. Also examines current status and prospects in selected emerging technology domains. Crosslisted with ISYE 6777.

PUBP 6801. Research Paper. 3 Credit Hours.
Either a professional policy research paper or a team research project including a co-authored policy research monograph prepared for a government or public affairs client.

PUBP 6XXX. Public Policy Elective. 1-21 Credit Hours.

PUBP 7000. Master's Thesis. 1-21 Credit Hours.

PUBP 8101. Workshop on Policy Research I. 1 Credit Hour.
Course provides an overview of research and professional socialization. It presents topics partially satisfying GT RCR policy for in-person training. Student will brainstorm dissertation topics.

PUBP 8102. Workshop on Policy Research II. 1 Credit Hour.
Course provides an overview of public policy research and professional socialization. It completes the sequence of topics satisfying GT RCR policy for in-person training.

PUBP 8200. Advanced Research Methods I. 3 Credit Hours.
The course will cover advanced policy analysis and modeling methods, including regression models, and other topics as time permits.

PUBP 8205. Advanced Research Methods II. 3 Credit Hours.
Building on Advanced Research Methods I, the course will cover advanced policy analysis and modeling methods, for example, panel data and nonparametric regression. Other policy research methods may be explored as time permits.

PUBP 8211. Microeconomic Theory and Applications. 3 Credit Hours.
Extensions of microeconomic theory-consumer theory, firm theory, and markets-to situations involving many periods and uncertainty. Introduces students to general equilibrium, externality, and welfare economics.

PUBP 8500. Research Seminar in Public Policy. 3 Credit Hours.
Exploration of the purpose of and approaches used in public policy research. Requires development of original empirical research.

PUBP 8510. Logic of Policy Inquiry. 3 Credit Hours.
An examination of the role of knowledge claims in policy formulation and analysis. Policy formulations have embedded knowledge claims and the course will prepare students to assess the validity of arguments, the relevance and quality of evidence in policy knowledge claims and the role and merits of their assumptions.

PUBP 8520. Scope and Theory of Public Policy. 3 Credit Hours.
Overview of core literature of public policy including theories of public policy, the history of public policy studies, the institutional structure of policy analysis, the profession of policy research, and the intellectual bases of public policy studies.

PUBP 8530. Advanced Science and Technology Policy. 3 Credit Hours.
Overview of core literature of technology and science policy, theories of innovation, intellectual foundations of technology and science policy.

PUBP 8540. Advanced Environmental Policy. 3 Credit Hours.
Overview of core literature of environmental policy, theories of environmental policy, intellectual foundations of environmental policy.

PUBP 8550. Advanced Urban and Regional Economic Development Policy. 3 Credit Hours.
Overview of core literature of economic development policy, theories of economic development in urban and regional settings, intellectual foundations of economic development policy.

PUBP 8590. Dissertation Colloquium. 3 Credit Hours.
Seminar focusing on dissertation research preparation, culminates in public colloquium in which students present preliminary dissertation proposal.

PUBP 8751. Big Data and Public Policy. 3 Credit Hours.
Introduces fundamentals of big data and quantitative methods for public policy and social science applications. Topics for applications vary by semester.

PUBP 8801. Special Topics. 1 Credit Hour.

PUBP 8802. Special Topics. 2 Credit Hours.

PUBP 8803. Special Topics. 3 Credit Hours.

PUBP 8811. Special Topics. 1 Credit Hour.

PUBP 8812. Special Topics. 2 Credit Hours.

PUBP 8813. Special Topics. 3 Credit Hours.

PUBP 8821. Special Topics. 1 Credit Hour.

PUBP 8822. Special Topics. 2 Credit Hours.

PUBP 8823. Special Topics. 3 Credit Hours.

PUBP 8831. Special Topics. 1 Credit Hour.

PUBP 8832. Special Topics. 2 Credit Hours.

PUBP 8833. Special Topics. 3 Credit Hours.

PUBP 8900. Special Problems. 1-21 Credit Hours.

PUBP 8910. Special Problems. 1-21 Credit Hours.

PUBP 8920. Special Problems. 1-21 Credit Hours.

PUBP 8930. Special Problems. 1-21 Credit Hours.

PUBP 8940. Special Problems. 1-21 Credit Hours.

PUBP 8950. Special Problems. 1-21 Credit Hours.

PUBP 8997. Teaching Assistantship. 1-9 Credit Hours.
For graduate students holding a teaching assistantship.

PUBP 8998. Research Assistantship. 1-9 Credit Hours.
For graduate students holding a research assistantship.

PUBP 8999. Preparation for the Doctoral Qualifying Examination. 1-21 Credit Hours.

PUBP 9000. Doctoral Thesis. 1-21 Credit Hours.

Russian (RUSS)

RUSS 1001. Elementary Russian I. 4 Credit Hours.
An introduction to Russian language and culture. First half of a survey of basic Russian grammar and the development of the four language skills of listening, speaking, reading, and writing. The course includes an orientation to aspects of everyday life in Russia. Humanities credit awarded upon successful completion of RUSS 1002 or RUSS 2001.

RUSS 1002. Elementary Russian II. 4 Credit Hours.
Second half of an introduction to Russian language and culture. Second half of a survey of basic Russian grammar and the development of the four basic language skills of listening, speaking, reading, and writing. The course includes an orientation to aspects of everyday life in Russia. Credit not allowed for both RUSS 1002 and RUSS 1692.

RUSS 10X1. Trans Elementary Russian I. 3 Credit Hours.

RUSS 10X2. Trans Elementary Russian II. 3 Credit Hours.

RUSS 1250. Vampires and Memory of Stalinism in Post-Soviet Russia. 3 Credit Hours.
Gothic aesthetics in post-Soviet Russian and U.S. vampire fiction and films. Post-Soviet fiction and movies as a source for studying historical memory. Conducted in English.

RUSS 1692. Intensive Elementary Russian II. 3 Credit Hours.
Continues introduction to fundamental Russian grammar and development of four modalities -- speaking, reading, listening, and writing -- in intensive immersion environment in Russia. Credit not allowed for both RUSS 1692 and RUSS 1002.

RUSS 1811. Special Topics. 1 Credit Hour.
Topics of current interest in Russian.

RUSS 1813. Special Topics. 3 Credit Hours.
Topics of current interest in Russian.

RUSS 1814. Special Topics. 4 Credit Hours.
Topics of current interest in Russian.

RUSS 1821. Special Topics. 1 Credit Hour.
Topics of current interest in Russian.

RUSS 1XXX. Russian Elective. 1-21 Credit Hours.

RUSS 2001. Intermediate Russian I. 3 Credit Hours.
A review and extension of basic grammar with intensive vocabulary-building and focus on development of idiom on the basis of conversation, reading, and writing activities. Includes reading and discussion of stories and magazine articles of general cultural interest with follow-up composition assignments. Credit not allowed for both RUSS 2001 and RUSS 2691.

RUSS 2002. Intermediate Russian II. 3 Credit Hours.
A review and extension of basic grammar with intensive vocabulary-building and focus on development of idiom on the basics of conversation, reading, and writing activities. Includes reading and discussion of stories and magazine articles of general cultural interest with follow-up composition assignments. Credit not allowed for both RUSS 2002 and RUSS 2692.

RUSS 2691. Intensive Intermediate Russian I. 3 Credit Hours.
Review and extension of basic grammar, intensive vocabulary- building, and development of idiom on the basis of conversation, reading, and writing activities (in Russia). Credit not allowed for both RUSS 2691 and RUSS 2001.

RUSS 2692. Intensive Intermediate Russian II. 3 Credit Hours.
Review and extension of basic grammar, intensive vocabulary- building, and development of idiom on the basis of conversation, reading, and writing activities (in Russia). Credit not allowed for both RUSS 2692 and RUSS 2002.

RUSS 2694. Internship Assistantship. 1-21 Credit Hours.
Modern Language Undergraduate Internship for pay for freshmen and sophomores, by permit only. The internship experience must be at a unit or agency approved by the School of Modern Language.

RUSS 2695. Undergraduate Internship. 1-21 Credit Hours.
Modern Language Undergraduate Internship for credit for freshmen and sophomores, by permit only. The internship experience must be at a unit or agency approved by the School of Modern Languages.

RUSS 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

RUSS 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

RUSS 2811. Special Topics. 1 Credit Hour.
Topics of current interest in Russian.

RUSS 2813. Special Topics. 3 Credit Hours.
Topics of current interest in Russian.

RUSS 2821. Special Topics. 1 Credit Hour.
Topics of current interest in Russian.

RUSS 2XXX. Russian Elective. 1-21 Credit Hours.

RUSS 3001. Advanced Russian I. 3 Credit Hours.
First half of advanced courses in Russian conversation and composition. Discussion of controversial issues with the goal of self-expression in coherent paragraphs. Advanced grammar topics.

RUSS 3002. Advanced Russian II. 3 Credit Hours.
Second half of advanced courses in Russian conversation and composition. Discussion of controversial issues with the goal of self-expression in coherent paragraphs. Advanced grammar topics.

RUSS 3005. Russian for Heritage Speakers. 3 Credit Hours.
Russian-language communication skills for heritage speakers. Focus on grammar and orthography, stylistics of adult/professional communication. Reading, discussion and writing on contemporary topics. Taught in Russian. Credit will not be awarded for both RUSS 3005 and RUSS 3001.

RUSS 3222. The Russian Twentieth Century in Literature and Film. 3 Credit Hours.
Russian twentieth-century literature and film. Discussion of historical and cultural context, aesthetics, structure and meaning. Reading and discussion in English.

RUSS 3242. Urban Mythologies in Russian Literature. 3 Credit Hours.
Students analyze iconic texts that have been shaped by both Russian and non-Russian urban environments across generations. Conducted in English.

RUSS 3350. Russian and American Mass Cultures. 3 Credit Hours.
Trends, genres and youth movements existing in contemporary American and Russian mass culture area compared to distinguish important cultural differences and similarities. Conducted in English.

RUSS 3691. Intensive Advanced Russian. 3 Credit Hours.
Intensive development of aural/oral communication skills, capitalizing on a rich linguistic environment. Review and expansion of grammar, practiced in context. Focus on description, narration and comparison.

RUSS 3692. Advanced Reading and Composition for Business, Science and Technology. 3 Credit Hours.
Advanced reading and writing skills. Study of syntax enables more sophisticated paragraph structure. Readings include newspaper texts on current affairs, business, science and technology.

RUSS 3695. Contemporary Russia. 3 Credit Hours.
General introduction to political, cultural, social, and historical background of Russian domestic and foreign politics. Lectures in English. Discussion section and research project in Russian.

RUSS 3698. Russia Yesterday and Today. 1 Credit Hour.
Lecture and discussion of a range of problems confronting Russian society today and the depth of their connection to Russia's historical heritage. Taught in English.

RUSS 3803. Special Topics. 3 Credit Hours.
Permits a group of students and a professor to pursue areas of the Russian language not extensively treated in other courses in the department.

RUSS 3811. Special Topics. 1 Credit Hour.

RUSS 3812. Special Topics. 2 Credit Hours.
Topics of current interest in Russian.

RUSS 3813. Special Topics. 3 Credit Hours.
Permits a group of students and a professor to pursue areas of the Russian language not extensively treated in other courses in the department.

RUSS 3823. Special Topics. 3 Credit Hours.
Permits a group of students and a professor to pursue areas of the Russian language not extensively treated in other courses in the department.

RUSS 3833. Special Topics. 3 Credit Hours.
Topics of current interest in Russian.

RUSS 3XXX. Russian Elective. 1-21 Credit Hours.

RUSS 4300. Imperial Imagination Through Literature and Film. 3 Credit Hours.
This course examines how Russian, Soviet, and post-Soviet culture constructed the representations of the parts of the former Russian/Soviet empire. Taught in Russian.

RUSS 4320. Nineteenth-Century Russian Writers. 3 Credit Hours.
Trends and paradigms in Russian literature from Pushkin to Chekhov. Conducted in Russian.

RUSS 4335. Technology, Society, and Culture in the Soviet Union and Russia. 3 Credit Hours.
Problems of sustainability, ecology, medicine, industrial development, and technological progress as manifested in Soviet and Russian society and reflected in culture. Conducted in Russian.

RUSS 4340. Invention of Business Discourse in Russia (1990-). 3 Credit Hours.
Origins of business discourse in post-Soviet Russia. Transformations in meaning of words and related practices during process of acculturation. Conducted in Russian.

RUSS 4360. Russian Culture through the Prism of Song. 3 Credit Hours.
Russian songs as object of study and focal points for broader exploration of key issues in Russian and Soviet culture and history. Conducted in Russian.

RUSS 4500. Russian Intercultural Capstone Seminar. 3 Credit Hours.
Russia and the West: cultural models and political fault lines. Historical debates that continue to divide and engage Russians. Conducted in Russian.

RUSS 4692. Intensive Advanced Russian II. 3 Credit Hours.
Russian LBAT summer program. Reading on and discussion of contemporary Russian and global issues. Advanced grammar and syntax. Stylistics of written discourses. Taught in Russian.

RUSS 4693. Intensive Advanced Russian III. 3 Credit Hours.
Russian LBAT summer program. Reading on and discussion of contemporary Russian and global issues. Advanced grammar and syntax. Stylistics of written discourses. Taught in Russian.

RUSS 4694. Internship Assistantship. 1-21 Credit Hours.
Modern Language Undergraduate Internship for pay for junior and seniors, by permit only. The internship experience must be at a unit or agency approved by the School of Modern Languages.

RUSS 4695. Russian Internship. 1-3 Credit Hours.
Professional experience with a business/organization in which students enhance their language skills and cultural knowledge in Russian in relation on the practical goals/objectives of the entity.

RUSS 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

RUSS 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

RUSS 4813. Special Topics. 3 Credit Hours.
Topics of interest not covered in the regular course offerings.

RUSS 4823. Special Topics. 3 Credit Hours.
Topics of current interest in Russian.

RUSS 4833. Special Topics. 3 Credit Hours.
Topics of current interest in Russian.

RUSS 4901. Special Problems in Russian. 1-21 Credit Hours.
Provides the special instruction required under special programs.

RUSS 4902. Special Problems in Russian. 1-21 Credit Hours.
Provides the special instruction required under special programs.

RUSS 4XXX. Russian Elective. 1-21 Credit Hours.

RUSS 6252. Russian Domestic Internship. 1-3 Credit Hours.
Students complete domestic internships. Conducted in Russian. Online course.

RUSS 6360. Russian Culture through Songs. 3 Credit Hours.
Russian songs as object of study and focal points for broader exploration of key issues in Russian and Soviet culture and history. Conducted in Russian.

RUSS 6500. Intercultural Seminar. 3 Credit Hours.
Russia and the West: cultural models and political fault lines. Historical debates that continue to divide and engage Russians. Conducted un Russian.

RUSS 6503. Professional Portfolio Development. 3 Credit Hours.
Preparation of a professional portfolio connecting experiences and coursework in the MS program towards career preparation. Conducted in Russian.

RUSS 6510. Applied Language Practicum. 3 Credit Hours.
Students will serve as researchers, student aides and apprentice instructors for any 3/4000-level undergraduate course approved by their adviser and the course.

RUSS 6511. Applied Language Practicum Abroad. 3 Credit Hours.
Students serve as researchers and apprentice instructors in the LBAT or other faculty-led overseas language immersion program of the School of Modern Languages.

RUSS 6695. Russian Internship Abroad. 1-3 Credit Hours.
Students complete internships abroad in a Russian-speaking region. Conducted in Russian. Online course.

RUSS 6696. Russian Internship Abroad. 1-6 Credit Hours.
Students complete internships abroad in a Russian-speaking region. Conducted in Russian. Online course.

RUSS 6998. Master's Project. 1-6 Credit Hours.
Optional project course taught in Russian.

RUSS 7000. Master's Thesis. 1-6 Credit Hours.
Optional thesis course.

RUSS 8803. Special Topics. 3 Credit Hours.
Topics of current interest not covered in the regular course offerings.

RUSS 8804. Special Topics. 4 Credit Hours.
Special Topics in Russian Language and Literature.

RUSS 8901. Special Problems in Russian. 1-21 Credit Hours.
Provides the special instruction required under special programs.

RUSS 8902. Special Problems in Russian. 1-21 Credit Hours.
Provides the special instruction required under special programs.

RUSS 8903. Special Problems in Russian. 1-21 Credit Hours.
Provides the special instruction required under special programs.

Science (SCI)

SCI 1XXX. Science Elective. 1-21 Credit Hours.

SCI 2XXX. Science Elective. 1-21 Credit Hours.

Serve Learn Sustain (SLS)

SLS 2803. Special Topics. 3 Credit Hours.
Special Topics for Serve-Learn-Sustain.

SLS 3110. Technology and Sustainable Community Development. 3 Credit Hours.
This course will explore the role of technology in the development of sustainable communities, locally and internationally.

SLS 3120. Foundations of Sustainable Systems. 3 Credit Hours.
This course teaches decision-making where a systems focus on the environmental and social dimensions of a design, project, innovation or business model are explicitly considered.

SLS 3803. Special Topics. 3 Credit Hours.
Special Topics for Serve-Learn-Sustain.

Sociology (SOC)

SOC 1101. Introduction to Sociology. 3 Credit Hours.
A study of basic social relations, including social structure and functions, analysis of social processes, the foundations of personality, and analysis of social organization.

Spanish (SPAN)

SPAN 1001. Elementary Spanish I. 3 Credit Hours.
An introduction to the Spanish language and the cultures of the Spanish-speaking world. Beginning of a survey of basic Spanish grammar and the development of the four language skills of listening, speaking, reading and writing. Some aspects of everyday life in the Spanish-speaking world will also be introduced. Conducted in Spanish. No native speakers allowed. Credit not allowed for both Span 1001 and 1101.

SPAN 1002. Elementary Spanish II. 3 Credit Hours.
The second part of an introduction to the Spanish language and cultures of the Spanish-speaking world. Completion of the survey of basic Spanish grammar and the development of the four language skills of listening, speaking, reading, and writing. Aspects of everyday life in the Spanish-speaking world will also be introduced. Conducted in Spanish. No native speakers allowed. Credit not allowed for both SPAN 1002 and SPAN 1102.

SPAN 1813. Special Topics. 3 Credit Hours.
Topics of current interest in Spanish.

SPAN 1XXX. Spanish Elective. 1-21 Credit Hours.

SPAN 2001. Intermediate Spanish I. 3 Credit Hours.
Review of basic grammatical concepts: conversational, reading, and writing activities; cultural aspects of the Hispanic world. Conducted in Spanish. No native speakers allowed.

SPAN 2002. Intermediate Spanish II. 3 Credit Hours.
Review of basic grammatical concepts; conversational, reading, and writing activities; cultural aspects of the Hispanic world. Conducted in Spanish. No native speakers allowed.

SPAN 2690. Intermed Span Abroad. 3 Credit Hours.
Intensive intermediate Spanish conducted abroad with focus on issues and perspectives of the target region.

SPAN 2694. Internship Assistantship. 1-21 Credit Hours.
Modern Language Undergraduate Internship for pay for freshmen and sophomores, by permit only. The internship experience must be at a unit or agency approved by the School of Modern Language.

SPAN 2695. Undergraduate Internship. 1-21 Credit Hours.
Modern Language Undergraduate Internship for credit for freshmen and sophomores, by permit only. The internship experience must be at a unit or agency approved by the School of Modern Languages.

SPAN 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

SPAN 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

SPAN 2813. Special Topics. 3 Credit Hours.
Topics of current interest in Spanish.

SPAN 2XXX. Spanish Elective. 1-21 Credit Hours.

SPAN 3040. A Practical Application of Spanish Grammar. 3 Credit Hours.
A review of important structures of Spanish, presented in communicative contexts vital to the academic careers of students. Taught in Spanish.

SPAN 3050. Introduction to Reading Hispanic Literature. 3 Credit Hours.
This course bridges language study and the study of literature by helping students read, understand , and interpret literature as a system of communication in Spanish.

SPAN 3061. Spanish for Business I: Fundamentals. 3 Credit Hours.
Introduction to business language in the Hispanic world. Development of linguistic abilities to this end, with emphasis on those cultural factors that lead to commercial success. Conducted in Spanish.

SPAN 3064. Medical Spanish. 3 Credit Hours.
This course facilitates acquisition of a broad vocabulary and awareness of cultural customs and trends pertaining to the healthcare field. Taught in Spanish.

SPAN 3070. Latin American Music. 3 Credit Hours.
Students study the musical traditions of the Andes, Mexico and the Caribbean, focusing on the rhythms, instruments, artists, style and tendencies present. Taught in Spanish.

SPAN 3101. Spanish Conversation: Issues and Strategies I. 3 Credit Hours.
Development of communicative ability and cross-cultural awareness through discussion of contemporary issues in the Hispanic world. Conducted in Spanish. No native speakers allowed.

SPAN 3111. Composition: Analysis and Development I. 3 Credit Hours.
Writings from the Hispanic world used as a springboard for analysis and enrichment of self-expression and development of precision in written communication. Incorporates grammar review. Conducted in Spanish. No native speakers allowed.

SPAN 3122. Cultural History of Spain II: Nineteenth and Twentieth Century Spain. 3 Credit Hours.
History of Spanish culture from 1800 to the present. Conducted in Spanish.

SPAN 3130. Spanish for Heritage Speakers. 3 Credit Hours.
Course designed for heritage speakers with little or no formal instruction in Spanish who want to expand their linguistic skills in a content-based framework.

SPAN 3151. Conversation Practicum. 3 Credit Hours.
This course combines current event discussion with ongoing conversation practice. Students participate in in-class discussions plus weekly language exchanges with native Spaniards. Taught in Spanish.

SPAN 3200. Globalization in Latin America. 3 Credit Hours.
Case-studies examination of globalization in Latin America regarding politics and industry, migration, culture and communication, and health and the environment. Taught in Spanish.

SPAN 3211. Spain Today. 3 Credit Hours.
This course introduces students to current issues in the culture and history of contemporary Spain. Articles, videos, and news clips are used as springboard for discussion. Conducted in Spanish.

SPAN 3235. Latin America Today. 3 Credit Hours.
Selected journalistic and literary writings used as a springboard for discussion of social, economic, and political issues of contemporary Latin America. Conducted in Spanish.

SPAN 3241. The Individual and the Family in Hispanic Literature. 3 Credit Hours.
Analysis and discussion of the portrayal of the individual and the family in selected readings from Hispanic literature. Conducted in Spanish.

SPAN 3242. Society in Hispanic Literature. 3 Credit Hours.
Study of Hispanic society and political thought in selected literary works. Conducted in Spanish.

SPAN 3260. Identity in Hispanic American Literature. 3 Credit Hours.
This course examines the construction of personal, cultural, national, political, and regional identity in Hispanic American literature over the past two centuries. Taught in Spanish.

SPAN 3300. Satire & Media in the Americas. 3 Credit Hours.
This course explores how new types pf satire challenge traditional media and impacts political communication in today's democratic societies in the Americas. Taught in Spanish.

SPAN 3500. Science Fiction in Latin America. 3 Credit Hours.
This course is a survey of Latin America science-fiction. Taught in Spanish.

SPAN 3590. Issues of Sustainable Development in the Andean Region. 3 Credit Hours.
Historical and social context of contemporary issues of cultural, economic and environmental sustainability in the Andean region. Taught in Spanish.

SPAN 3591. Cultural Patrimony in Peru. 3 Credit Hours.
Using literature, film and art, this course examines cultural patrimony in Peru and its impact on society, economy, environment and threats to its preservation. Conducted in Spanish.

SPAN 3592. Culture and Commerce in the Andes. 3 Credit Hours.
Examines the 'business of nature' in the extractive economies of the Andes and culture clashes of Western and indigenous perspectives of development. Taught in Spanish.

SPAN 3690. Commerce and Sustainable Communities. 3 Credit Hours.
Study of the connectedness and community impact of contemporary issues of economic, sociocultural, and environmental sustainability in Mexico. Conducted in Spanish. Part of the Spanish intensive summer LBAT program. Admission by application only.

SPAN 3691. Business Communication and Correspondence in the Hispanic. 3 Credit Hours.
Refinement of accuracy/flexibility in oral/written expression. Focus on appropriate use of strategies, business negotiation protocols, lexical precision in business transactions. Incorporates grammar review. Part of the Spanish intensive summer language program. Admission by application only.

SPAN 3692. Business and Culture in the Hispanic World. 3 Credit Hours.
Study of cultural issues, tendencies, and traditional patterns of behavior in Spanish-speaking people as they relate to business practices. Value systems and formal manifestations. Regional variations, including the U.S. Hispanic culture. Part of the Spanish intensive summer language program. Admission by application only.

SPAN 3693. Science and Technology in the Hispanic World. 3 Credit Hours.
Study of business organizations and use of technology in the Spanish-speaking world. Specialized vocabularies of business, economics, statistics, and computer science. Geographical and anthropological background. Part of the Spanish intensive summer language program. Admission by application only.

SPAN 3694. Business and Culture in the Hispanic World: Seminar Abroad. 3 Credit Hours.
Field study of technology, economic trends, business firms, financial institutions, and cultural protocols in the Spanish-speaking area. Part of the Spanish intensive summer language program. Admission by application only.

SPAN 3697. Spanish for Health Care Professionals. 3 Credit Hours.
Culture-specific conceptions of health, medical vocabulary, professional-patient protocols, professional-professional protocols, symptoms, treatments. Taught in Spanish.

SPAN 3698. Health Care Industry in Spain. 3 Credit Hours.
Study of culture-specific values in health systems in Spain/ Europe. Visits to local sites. Taught in Spanish.

SPAN 3813. Special Topics. 3 Credit Hours.
Topics of current interest in Spanish.

SPAN 3821. Special Topics. 1 Credit Hour.
Topics of current interest in Spanish.

SPAN 3822. Special Topics. 2 Credit Hours.
Topics of current interest in Spanish.

SPAN 3823. Special Topics. 3 Credit Hours.
Topics of current interest in Spanish.

SPAN 3833. Special Topics. 3 Credit Hours.
Topics of current interest in Spanish.

SPAN 3XXX. Spanish Elecitve. 1-21 Credit Hours.

SPAN 4061. Spanish for Science and Technology I: Fundamentals. 3 Credit Hours.
Introduction to scientific vocabulary and discourse in Spanish, by fields of interest. Study of expository texts, numerical expressions, and graphic aids. Development of some reading and translation strategies. Writing feature descriptions and article/report summaries in Spanish. Conducted in Spanish.

SPAN 4062. Spanish for Science and Technology II: Applications. 3 Credit Hours.
Advanced analysis of scientific and technological discourse in Spanish. Focus on reading strategies and oral discussion of topics such as use and transfer of technology and the acculturation issues that follow. Further development of comprehension, production, and translation strategies, with emphasis on professional communications and on writing feature descriptions, summaries, and abstracts. Conducted in Spanish.

SPAN 4065. Spanish Linguistics. 3 Credit Hours.
This course is designed to develop the students' understanding of the linguistic structure of the Spanish language. The topics covered in this course include: phonetics, phonology, morphology, syntax, language change, and language variation.

SPAN 4101. Advanced Communication Workshop. 3 Credit Hours.
Advancement of oral and written proficiency using a workshop and project-development format to focus on communicative precision, style and register. Includes some treatment of grammar. No native speakers allowed.

SPAN 4102. Spanish for the Professions. 3 Credit Hours.
This course develops communication skills for professional purposes with an emphasis on specialized vocabulary building and cultural nuances of the Spanish-speaking world. Taught in Spanish.

SPAN 4150. Learning in the Hispanic Community. 3 Credit Hours.
This class combines classroom discussion with Hispanic community service projects to allow students to study Hispanic cultures and practice Spanish with native speakers. Conducted in Spanish.

SPAN 4156. Spanish Service-Learning Abroad I. 3 Credit Hours.
Students complete service projects in a Spanish-speaking country abroad and attend weekly class meetings that combine student presentations and documentaries with a guest-speaker series. Conducted in Spanish.

SPAN 4157. Spanish Service-Learning Abroad II. 3 Credit Hours.
Students complete service projects in a Spanish-speaking country abroad and gain an in-country immersion opportunity that hones oral and aural skills and increases cultural competence through real-life interactions with the host community abroad. Conducted in Spanish.

SPAN 4158. Social, Cultural, and Linguistic Diversity in Spain. 3 Credit Hours.
This course examines the social, cultural, and linguistic dimensions of sustainability and the concepts of diversity and equity in the Spanish context. Taught in Spanish.

SPAN 4160. U.S. Spanish: Language and Cultures. 3 Credit Hours.
Linguistic groups, changes, bilingualism, customs, traditions of US Hispanics. Course project on current migration, legal, financial, educational, health, media or political issues/advances. Conducted in Spanish.

SPAN 4165. Bilingualism in the Spanish Speaking World. 3 Credit Hours.
This course introduces students to bilingualism at both individual and societal levels within the Hispanic communities in the US, Spain, and Latin America. Conducted in Spanish.

SPAN 4170. Spanish Applied Linguistics. 3 Credit Hours.
Advanced linguistic analysis of the Spanish language, particularly as it contrasts with English. Conducted in Spanish.

SPAN 4220. Nation and Narration in Latin America. 3 Credit Hours.
This course examines the connection between nation and narration in Latin American literature and film and explores the narrative construction of national identities. Taught in Spanish.

SPAN 4237. Food, Power, and Sustainability in Latin America. 3 Credit Hours.
Food as gateway to region-by-region study of issues of sustainable development in Latin America. Taught in Spanish.

SPAN 4244. Visual Culture and Social Agenda in Latin America. 3 Credit Hours.
Historical and cultural analysis of the role of art, visual image and iconography as social commentator and public platform in Latin America. Taught in Spanish.

SPAN 4251. Hispanic Community Internship. 3 Credit Hours.
Students complete inernships with agencies, organizations, and businesses serving Atlanta Hispanics, using their Spanish language skills in a professional work environment. Conducted in Spanish.

SPAN 4255. Hispanic Drama Workshop. 3 Credit Hours.
Literary and theatrical aspects of Hispanic drama are explored through class discussion and performance of a collection of contemporary one-act plays. Conducted in Spanish.

SPAN 4270. Span Sociolinguistics. 3 Credit Hours.
This course explores the relationships between the Spanish language and the Hispanic cultures and societies of the world. Taught in Spanish.

SPAN 4350. Ibero-American Cities. 3 Credit Hours.
This course examines the representation and development of cities in the Hispanic World. Students develop three urban projects based on their study. Taught in Spanish.

SPAN 4360. Covering Arts & Latin(o) American Culture in the U.S.. 3 Credit Hours.
This course explores contemporary media reporting on the LatinX culture in the US and Latin America. Taught in Spanish and English.

SPAN 4401. Globalization and Migration. 3 Credit Hours.
Print and filmic texts serve as gateway to context-specific issues of migration in the Spanish-speaking world from both sender- and receiver-country perspectives. Taught in Spanish.

SPAN 4405. Latin American Documentaries. 3 Credit Hours.
This course explores the documentary traditions of Chile, Argentina and Cuba to learn about the history of Latin American societies. Taught in Spanish.

SPAN 4410. Media and Power in Latin America. 3 Credit Hours.
This course explores the tensions between media and power in relation to the struggle for freedom of expression in Latin American countries. Taught in Spanish.

SPAN 4454. Latin America through Film. 3 Credit Hours.
Contemporary Latin American film serves as gateway to in-depth discussion of social, political, economic and cross-cultural perspectives. Conducted in Spanish.

SPAN 4460. Hispanic Digital Cultures. 3 Credit Hours.
Students explore recent developments in New Media and Digital Culture within the context of Latin American and Spanish cultures and societies. Taught in Spanish.

SPAN 4500. Advanced Intercultural Seminar. 3 Credit Hours.
Integrates cross-cultural research and reflection into discussion of current issues in the Hispanic world. Intended for students who have had some study abroad experience in a Spanish-speaking country. Conducted in Spanish.

SPAN 4690. Intercultural Dialogue. 3 Credit Hours.
Explores cultural identity in Latin America through live interviews, print, and film. Topics will vary. Taught in Spanish as part of the LBAT study abroad program.

SPAN 4693. Sustainability in Spain. 3 Credit Hours.
This course examines issues of economic and environmental sustainability as well as the relationship between the economy and the environment in Spain. Conducted in Spanish.

SPAN 4694. Internship Assistantship. 1-21 Credit Hours.
Modern Language Undergraduate Internship for pay for junior and seniors, by permit only. The internship experience must be at a unit or agency approved by the School of Modern Languages.

SPAN 4695. Spanish Internship. 1-3 Credit Hours.
Professional experience with a business/organization in which students enhance their language skills and cultural knowledge in Spanish in relation to the practical goals/objectives of the entity.

SPAN 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

SPAN 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

SPAN 4813. Special Topics. 3 Credit Hours.
Topics of interest not covered in the regular course offerings.

SPAN 4823. Special Topics. 3 Credit Hours.
Topics of current interest in Spanish.

SPAN 4833. Special Topics. 3 Credit Hours.

SPAN 4901. Special Problems in Spanish. 1-21 Credit Hours.
Provides the special instruction required under special programs.

SPAN 4902. Special Problems in Spanish. 1-21 Credit Hours.
Provides the special instruction required under special programs.

SPAN 4XXX. Spanish Elective. 1-21 Credit Hours.

SPAN 6101. Advanced Communication Workshop. 3 Credit Hours.
Advancement of oral and written proficiency using workshop and project-development formats to focus on communicative precision, style, register and grammar. Taught in Spanish.

SPAN 6170. Applied Linguistics. 3 Credit Hours.
This course introduces students to theoretical and practical aspects of Spanish as a foreign language and fundamental concepts in second language acquisition and teaching.

SPAN 6236. Media, Markets and Advertising in the Hispanic World. 3 Credit Hours.
This course uses print, broadcast and web-based media to explore the social structures and cultural values reflected in product consumption, marketing and advertising in Latin America. Conducted in Spanish.

SPAN 6237. Food, Power and Sustainability. 3 Credit Hours.
Food as gateway to region-by-region study of issues of sustainable development in Latin America. Taught in Spanish.

SPAN 6244. Visual Culture and Social Agenda in Latin America. 3 Credit Hours.
Historical and cultural analysis of the role of art, visual image and iconography as social commentator and public platform in Latin America. Taught in Spanish.

SPAN 6251. Hispanic Community Internship. 3 Credit Hours.
Students complete internships with agencies, organizations, and businesses serving Atlanta Hispanics, using their Spanish language skills in a professional work environment. Conducted in Spanish.

SPAN 6270. Span Sociolinguistics. 3 Credit Hours.
This course explores the relationships between the Spanish language and the Hispanic cultures and societies of the world. Taught in Spanish.

SPAN 6360. Covering Arts and Latin(o) American Culture in the U.S.. 3 Credit Hours.
This course explores contemporary media reporting on the LatinX culture in the US and Latin America. Taught in Spanish and English.

SPAN 6401. Globalization and Migration. 3 Credit Hours.
Print and filmic texts serve as gateway to context-specific issues of migration in the Spanish-speaking world from both sender- and receiver-country perspectives. Taught in Spanish.

SPAN 6405. Latin American Documentaries. 3 Credit Hours.
This course explores the documentary traditions of Chile, Argentina and Cuba to learn about the history of Latin American societies. Taught in Spanish.

SPAN 6410. Media and Power in Latin America. 3 Credit Hours.
This course explores the tension between media and power in relation to the struggle for freedom of expression in Latin American countries. Taught in Spanish.

SPAN 6454. Latin America through Film. 3 Credit Hours.
Contemporary Latin American film serves as gateway to in-depth discussion of social, political, economic and cross-cultural perspectives. Conducted in Spanish.

SPAN 6460. Hispanic Digital Cultures. 3 Credit Hours.
Students explore recent developments in new Media and Digital Culture within the context of Latin American and Spanish cultures and societies. Taught in Spanish.

SPAN 6500. Intercultural Seminar. 3 Credit Hours.
Integrates cross-cultural research and reflection into discussion of current issues in the Spanish-speaking world. Taught in Spanish.

SPAN 6501. Theory and Foundations Seminar. 3 Credit Hours.
This course seeks to increase theoretical knowledge and practical applications in key areas of culture, literature/media, and linguistics studies. Taught in Spanish.

SPAN 6503. Professional Portfolio Development. 3 Credit Hours.
Preparation of a professional portfolio connecting experiences and coursework in the MS program towards career preparation. Conducted in Spanish.

SPAN 6510. Applied Language Practicum Abroad. 3 Credit Hours.
Students will serve as researchers, student aides and apprentice instructors for any 3/4000-level undergraduate course approved by their adviser.

SPAN 6511. Applied Language Practicum Abroad. 3 Credit Hours.
Students serve as researchers and apprentice instructors in LBAT or other faculty-led overseas language immersion program of the School of Modern Languages.

SPAN 6690. Intercultural Dialogue. 3 Credit Hours.
Explores cultural identity in Latin America through live interviews, print, and film. Topics vary. Taught in Spanish overseas as part of LBAT study abroad program.

SPAN 6693. Studies in Sustainable Development. 3 Credit Hours.
This course examines issues of economic and environmental sustainability as well as the relationship between the economy and the environment. Taught in Spanish.

SPAN 6695. Spanish Internship Abroad. 1-3 Credit Hours.
Students complete internships abroad in a Spanish-speaking country. Conducted in Spanish. Online course.

SPAN 6696. Internship Abroad Spanish B. 1-6 Credit Hours.
Students complete internships abroad in a Spanish-speaking country. Conducted in Spanish. Online course. 6 credits.

SPAN 6998. Master's Project. 1-6 Credit Hours.
Optional project course taught in Spanish.

SPAN 7000. Master's Thesis. 1-6 Credit Hours.
Master's Thesis.

SPAN 8803. Special Topics. 3 Credit Hours.
Special topics in Spanish Language and Literature.

SPAN 8901. Special Problems in Spanish. 1-21 Credit Hours.
Provides the special instruction required under special programs.

SPAN 8902. Special Programs in Spanish. 1-21 Credit Hours.
Provides the special instruction required under special programs.

SPAN 8903. Special Problems in Spanish. 1-21 Credit Hours.
Provides the special instruction required under special programs.

Social Science Elective (SS)

SS 1XXX. Social Science Elective. 1-21 Credit Hours.

SS 2XXX. Social Science Elective. 1-21 Credit Hours.

SS 3XXX. Social Science Elective. 1-21 Credit Hours.

SS 4XXX. Social Science Elective. 1-21 Credit Hours.

Cross Enrollment (UCGA)

UCGA 1001. Cross Enroll-Agnes Scott. 1-21 Credit Hours.

UCGA 1002. Cross Enroll-Atlanta College of Art. 1-21 Credit Hours.

UCGA 1003. Cross Enroll-AU Clark. 1-21 Credit Hours.

UCGA 1004. Cross Enroll-AU Morehouse. 1-21 Credit Hours.

UCGA 1005. Cross Enroll-AU Morris Brown. 1-21 Credit Hours.

UCGA 1006. Cross Enroll-AU Spelman. 1-21 Credit Hours.

UCGA 1007. Cross Enroll-Clayton College and State University. 1-21 Credit Hours.

UCGA 1008. Cross Enroll-Columbia Theological Seminary. 1-21 Credit Hours.

UCGA 1009. Cross Enroll-Emory University. 1-21 Credit Hours.

UCGA 1010. Cross Enroll-Georgia State University. 1-21 Credit Hours.

UCGA 1011. Cross Enroll-Kennesaw State University. 1-21 Credit Hours.

UCGA 1012. Cross Enroll-Mercer University. 1-21 Credit Hours.

UCGA 1013. Cross Enroll-Oglethorpe. 1-21 Credit Hours.

UCGA 1015. Cross Enroll-University of Georgia. 1-21 Credit Hours.

UCGA 1017. Cross Enroll -West Georgia. 1-21 Credit Hours.

UCGA 1018. Cross Enroll - Brenau. 1-21 Credit Hours.

UCGA 1019. Cross Enroll- Savannah College of Art. 1-21 Credit Hours.
CROSS ENROLL-SAVANNAH COLLEGE OF ART.

UCGA 1021. Cross Enroll-Georgia Gwinnett College. 1-21 Credit Hours.
CROSS-ENROLL-GEORGIA GWINNETT COLLEGE.

UCGA 2001. Cross Enroll-Agnes Scott. 1-21 Credit Hours.

UCGA 2002. Cross Enroll-Atlanta College of Art. 1-21 Credit Hours.

UCGA 2003. Cross Enroll-AU Clark. 1-21 Credit Hours.

UCGA 2004. Cross Enrol-AU Morehouse. 1-21 Credit Hours.

UCGA 2005. Cross Enroll-AU Morris Brown. 1-21 Credit Hours.

UCGA 2006. Cross Enroll-AU Spelman. 1-21 Credit Hours.

UCGA 2007. Cross Enroll-Clayton College and State University. 1-21 Credit Hours.

UCGA 2008. Cross Enroll-Columbia Theological Seminary. 1-21 Credit Hours.

UCGA 2009. Cross Enroll-Emory University. 1-21 Credit Hours.

UCGA 2010. Cross Enroll-Georgia State University. 1-21 Credit Hours.

UCGA 2011. Cross Enroll-Kennesaw State University. 1-21 Credit Hours.

UCGA 2012. Cross Enroll-Mercer University. 1-21 Credit Hours.

UCGA 2013. Cross Enroll-Oglethorpe. 1-21 Credit Hours.

UCGA 2015. Cross Enroll-University of Georgia. 1-21 Credit Hours.

UCGA 2017. Cross Enroll - West Georgia. 1-21 Credit Hours.

UCGA 2018. Cross Enroll - Brenau. 1-21 Credit Hours.

UCGA 2019. Cross Enroll-Savannah College of Art. 1-21 Credit Hours.
CROSS ENROLL-SAVANNAH COLLEGE OF ART.

UCGA 2021. CROSS-ENROLL-GEORGIA GWINNETT COLLEGE. 1-21 Credit Hours.
CROSS-ENROLL-GEORGIA GWINNETT COLLEGE.

UCGA 2110. Cross Enroll-Georgia State University. 1-21 Credit Hours.

UCGA 2210. Cross Enroll-Georgia State University. 1-21 Credit Hours.

UCGA 2310. Cross Enroll-Ga State University. 1-21 Credit Hours.

UCGA 3001. Cross Enroll-Agnes Scott. 1-21 Credit Hours.

UCGA 3002. Cross Enroll-Atlanta College of Art. 1-21 Credit Hours.

UCGA 3003. Cross Enroll-AU Clark. 1-21 Credit Hours.

UCGA 3004. Cross Enroll-AU Morehouse. 1-21 Credit Hours.

UCGA 3005. Cross Enroll-AU Morris Brown. 1-21 Credit Hours.

UCGA 3006. Cross Enroll-AU Spelman. 1-21 Credit Hours.

UCGA 3007. Cross Enroll-Clayton College and State University. 1-21 Credit Hours.

UCGA 3008. Cross Enroll-Columbia Theological Seminary. 1-21 Credit Hours.

UCGA 3009. Cross Enroll-Emory University. 1-21 Credit Hours.

UCGA 3010. Cross Enroll-Georgia State University. 1-21 Credit Hours.

UCGA 3011. Cross Enroll-Kennesaw State University. 1-21 Credit Hours.

UCGA 3012. Cross Enroll-Mercer University. 1-21 Credit Hours.

UCGA 3013. Cross Enroll-Oglethorpe. 1-21 Credit Hours.

UCGA 3015. Cross Enroll-University of Georgia. 1-21 Credit Hours.

UCGA 3017. Cross Enroll - West Georgia. 1-21 Credit Hours.

UCGA 3018. Cross Enroll - Brenau. 1-21 Credit Hours.

UCGA 3019. Cross Enroll-Savannah College of Art. 1-21 Credit Hours.
CROSS ENROLL-SAVANNAH COLLEGE OF ART.

UCGA 3021. CROSS-ENROLL-GEORGIA GWINNETT COLLEGE. 1-21 Credit Hours.
CROSS-ENROLL-GEORGIA GWINNETT COLLEGE.

UCGA 3110. Cross Enroll-Georgia State University. 1-21 Credit Hours.

UCGA 3210. Cross Enroll-Ga State University. 1-21 Credit Hours.

UCGA 3310. Cross Enroll-Ga State University. 1-21 Credit Hours.

UCGA 4001. Cross Enroll-Agnes Scott. 1-21 Credit Hours.

UCGA 4002. Cross Enroll-Atlanta College of Art. 1-21 Credit Hours.

UCGA 4003. Cross Enroll-AU Clark. 1-21 Credit Hours.

UCGA 4004. Cross Enroll-AU Morehouse. 1-21 Credit Hours.

UCGA 4005. Cross Enroll-AU Morris Brown. 1-21 Credit Hours.

UCGA 4006. Cross Enroll-AU Spelman. 1-21 Credit Hours.

UCGA 4007. Cross Enroll-Clayton College and State University. 1-21 Credit Hours.

UCGA 4008. Cross Enroll-Columbia Theological Seminary. 1-21 Credit Hours.

UCGA 4009. Cross Enroll-Emory University. 1-21 Credit Hours.

UCGA 4010. Cross Enroll-Georgia State University. 1-21 Credit Hours.

UCGA 4011. Cross Enroll-Kennesaw State University. 1-21 Credit Hours.

UCGA 4012. Cross Enroll-Mercer University. 1-21 Credit Hours.

UCGA 4013. Cross Enroll-Oglethorpe. 1-21 Credit Hours.

UCGA 4015. Cross Enroll-University of Georgia. 1-21 Credit Hours.

UCGA 4017. Cross Enroll - West Georgia. 1-21 Credit Hours.

UCGA 4018. Cross Enroll - Brenau. 1-21 Credit Hours.

UCGA 4019. Cross Enroll-Savannah College of Art. 1-21 Credit Hours.
CROSS ENROLL-SAVANNAH COLLEGE OF ART.

UCGA 4021. CROSS-ENROLL-GEORGIA GWINNETT COLLEGE. 1-21 Credit Hours.
CROSS-ENROLL-GEORGIA GWINNETT COLLEGE.

UCGA 4210. Cross Enroll-Georgia State University. 1-21 Credit Hours.

UCGA 4301. Cross Enroll-Ga State BS/JD. 1-21 Credit Hours.
CROSS ENROLL-GA STATE BS/JD.

UCGA 4302. Cross Enroll-Ga State BS/JD. 1-21 Credit Hours.
CROSS ENROLL-GA STATE BS/JD.

UCGA 4303. Cross Enroll-Ga State BS/JD. 1-21 Credit Hours.
CROSS ENROLL-GA STATE BS/JD.

UCGA 4304. Cross Enroll-Ga State BS/JD. 1-21 Credit Hours.
CROSS ENROLL-GA STATE BS/JD.

UCGA 4305. Cross Enroll- Georgia State BS/JD. 1-21 Credit Hours.
CROSS ENROLL-GA STATE BS/JD.

UCGA 4306. Cross Enroll-Ga State BS/JD. 1-21 Credit Hours.
CROSS ENROLL-GA STATE BS/JD.

UCGA 4307. Cross Enroll-Georgia Stata BS/JD. 1-21 Credit Hours.
CROSS ENROLL-GA STATE BS/JD.

UCGA 4310. Cross Enroll-Georgia State University. 1-21 Credit Hours.

UCGA 4410. Cross Enroll-Georgia State University. 1-21 Credit Hours.

UCGA 4510. Cross Enroll-Georgia State University. 1-21 Credit Hours.

UCGA 4610. Cross Enroll-Georgia State University. 1-21 Credit Hours.

UCGA 4710. Cross Enroll-Georgia State University. 1-21 Credit Hours.

UCGA 4810. Cross Enroll-Georgia State University. 1-21 Credit Hours.

UCGA 4910. Cross Enroll-Georgia State University. 1-21 Credit Hours.

UCGA 6001. Cross Enroll-Agnes Scott. 1-21 Credit Hours.

UCGA 6002. Cross Enroll-Atlanta College of Art. 1-21 Credit Hours.

UCGA 6003. Cross Enroll-AU Clark. 1-21 Credit Hours.

UCGA 6004. Cross Enroll-AU Morehouse. 1-21 Credit Hours.

UCGA 6005. Cross Enroll-AU Morris Brown. 1-21 Credit Hours.

UCGA 6006. Cross Enroll-AU Spelman. 1-21 Credit Hours.

UCGA 6007. Cross Enroll-Clayton College and State University. 1-21 Credit Hours.

UCGA 6008. Cross Enroll-Columbia Theological Seminary. 1-21 Credit Hours.

UCGA 6009. Cross Enroll-Emory University. 1-21 Credit Hours.

UCGA 6010. Cross Enroll-Georgia State University. 1-21 Credit Hours.

UCGA 6011. Cross Enroll-Kennesaw State University. 1-21 Credit Hours.

UCGA 6012. Cross Enroll-Mercer University. 1-21 Credit Hours.

UCGA 6013. Cross Enroll-Oglethorpe. 1-21 Credit Hours.

UCGA 6015. Cross Enroll-University of Georgia. 1-21 Credit Hours.

UCGA 6016. Cross Enroll-Paper Institute. 1-21 Credit Hours.

UCGA 6017. Cross Enroll - West Georgia. 1-21 Credit Hours.

UCGA 6018. Cross Enroll - Brenau. 1-21 Credit Hours.

UCGA 6019. Cross Enroll-Savannah College of Art. 1-21 Credit Hours.
CROSS ENROLL-SAVANNAH COLLEGE OF ART.

UCGA 6021. CROSS-ENROLL-GEORGIA GWINNETT COLLEGE. 1-21 Credit Hours.
CROSS-ENROLL-GEORGIA GWINNETT COLLEGE.

STUDENT SERVICES

Programs & Services

- Academic Advising
- Academic Resources
- Career Services
- Counseling
- Dean of Students
- Dining Services
- Diversity Programs
- Fellowships
- Freshman Experience Program
- Health Services
- Institute Diversity, Equity, and Inclusion
  - Equity and Compliance Programs
  - Title IX Resources and Policies
- International Student Services
- LGBTQIA Resource Center
- Office of Minority Educational Development
- Orientation (new students)
- Tutoring & Workshops
- Women's Resource Center
- Veteran's Resource Center

Student Life

- Leadership & Civic Engagement
- Greek Affairs
- Student Government
- DramaTech

Departments

- Admissions (undergraduate)
- Admissions (graduate)
- Alumni Association
- Athletic Association
- Bursar's Office
- Office of the Vice President for Student Life and Dean of Students
- Center for Career Discovery and Development
- Financial Aid
- Housing
- Parking and Transportation
- Police (campus)
- Registrar's Office

Facilities

- Campus Recreation Center
- Information Technology
- Library & Information Center
- Interdisciplinary Research Centers
- Ferst Center
- Student Center

ARCHIVED CATALOGS

- 2022-23 Catalog
- 2021-22 Catalog
- 2020-21 Catalog
- 2019-20 Catalog
- 2018-19 Catalog
- 2017-18 Catalog
- 2016-17 Catalog
- 2015-16 Catalog
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