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. 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 (http://www.catalog.gatech.edu/programs/minor-biology)
- Minor in Physiology (http://www.catalog.gatech.edu/programs/minor-physiology)

Bachelor's Degrees
- Bachelor of Science in Biology (http://www.catalog.gatech.edu/programs/biology-bs)
- Bachelor of Science in Neuroscience (http://www.catalog.gatech.edu/programs/neuroscience-bs)

Master's Degrees
- Master of Science in Biology (http://www.catalog.gatech.edu/programs/biology-ms)
- Master of Science in Bioinformatics (http://www.catalog.gatech.edu/programs/bioinformatics-ms)
- Master of Science in Computational Science and Engineering (http://www.catalog.gatech.edu/programs/computational-science-engineering-ms)

Doctoral Degrees
- Doctor of Philosophy with a Major in Applied Physiology (http://www.catalog.gatech.edu/programs/applied-physiology-phd)
- Doctor of Philosophy with a Major in Biology (http://www.catalog.gatech.edu/programs/biology-phd)
- Doctor of Philosophy with a Major in Bioinformatics (http://www.catalog.gatech.edu/programs/bioinformatics-phd)
- Doctor of Philosophy with a Major in Computational Science and Engineering (http://www.catalog.gatech.edu/programs/computational-science-engineering-phd)
- Doctor of Philosophy with a Major in Ocean Science and Engineering (http://www.catalog.gatech.edu/programs/ocean-science-engineering-phd)
- Doctor of Philosophy with a Major in Quantitative BioSciences (http://www.catalog.gatech.edu/programs/quantitative-biosciences-phd)

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 APPH 1040 or HPS 1040.

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 1050 or HPS 1040.

APPH 11XX. Wellness Requirement. 1-21 Credit Hours.

APPH 1802. Special Topics. 2 Credit Hours.
Special Topics.

APPH 1XXX. Applied Physiology elective. 1-21 Credit Hours.

APPH 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).

APPH 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

APPH 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

APPH 2XXX. Applied Physiology elective. 1-21 Credit Hours.

APPH 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.

APPH 3300. Health Promotion. 3 Credit Hours.
Through small group discussions and lectures, this class examines contemporary health issues facing college students and the theory and skill required to conduct health promotion activities.

APPH 3500. Nutrition and Health. 2 Credit Hours.
Study of human nutrition as an applied science. Nutrition physiology, metabolism, energy, production, biochemical aspect, role of nutrients, weight control mechanisms, and preventative nutrition in health management will be covered.
APPH 3751. Human Anatomy and Physiology. 3 Credit Hours.
The study of human anatomy and fundamental physiological mechanisms with concentration in skeletal, muscular, nervous, circulatory, respiratory, digestive, urinary, endocrine, and reproductive systems. Crosslisted with BIOL 3751.

APPH 3753. Fundamentals of Anatomy. 3 Credit Hours.
Detailed studies of human body structures using a regional and systems approach. Emphasis is placed on structural relationships and the integration of body systems.

APPH 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.

APPH 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.

APPH 3756. Laboratory in Human Physiology. 1 Credit Hour.
A laboratory application of concepts in Physiology, providing hands-on experience focusing primarily on non-invasive human experiments supplemented with vitro tissues experiments.

APPH 3801. Special Topics. 1 Credit Hour.
Topics of current interest in applied physiology.

APPH 3802. Special Topics. 2 Credit Hours.
Topics of current interest in applied physiology.

APPH 3803. Special Topics. 3 Credit Hours.
Topics of current interest in applied physiology.

APPH 3804. Special Topics. 4 Credit Hours.
Topics of current interest in applied physiology.

APPH 3831. Special Topics. 1 Credit Hour.
Topics of current interest in applied physiology.

APPH 3832. Special Topics. 2 Credit Hours.

APPH 3833. Special Topics. 3 Credit Hours.
Topics of current interest in applied physiology.

APPH 3834. Special Topics. 4 Credit Hours.
Topics of current interest in applied physiology.

APPH 3901. Special Problems. 1-21 Credit Hours.
Individual studies in applied physiology.

APPH 3902. Special Problems. 1-21 Credit Hours.
Individual studies in applied physiology.

APPH 3903. Special Problems. 1-21 Credit Hours.
Individual studies in applied physiology.

APPH 3904. Special Problems. 1-21 Credit Hours.
Individual studies in applied physiology.

APPH 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.

APPH 4200. Kinesiological Basis of Human Movement. 3 Credit Hours.
Analysis of human movement from a kinesiological, neural and anatomical perspective including the study of locomotion and the mechanisms of selected musculoskeletal injuries, chronic and acute.

APPH 4238. Ion Channel Structure, Function and Regulation. 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.

APPH 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. Credit not allowed for both APPH 4400 and APPH 6400.

APPH 4600. Muscle Structure and Plasticity. 3 Credit Hours.
To provide an in-depth understanding of the biological processes underlying skeletal muscle structure and function.

APPH 4651. Human Anatomy. 4 Credit Hours.
The study of human system anatomy involving cadaver dissection, lectures and practical exams. The human muscular, nervous, skeletal and cardiorespiratory systems will be emphasized.

APPH 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

APPH 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research under the guidance of a faculty member.

APPH 4801. Special Topics. 1 Credit Hour.
Topics of current interest in applied physiology.

APPH 4802. Special Topics. 2 Credit Hours.
Topics of current interest in applied physiology.

APPH 4803. Special Topics. 3 Credit Hours.
Topics of current interest 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 4832. Special Topics. 2 Credit Hours.
Topics of current interest in applied physiology.

APPH 4833. Special Topics. 3 Credit Hours.
Topics of current interest in applied physiology.

APPH 4834. Special Topics. 4 Credit Hours.
Topics of current interest in applied physiology.

APPH 4835. 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 artificial 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 animal 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 6223. CAD/CAM in Prosthetics and Orthotics Laboratory. 1 Credit Hour.
Theoretical and practical analysis of the application of computer-aided design and manufacturing to prosthetics and orthotics. Includes methods of digitization and multiple manufacturing processes.

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 limb 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 6234. Physical Activity as a Human Behavior. 3 Credit Hours.
Focus is on understanding physical activity as a behavior using health behavior change models. An interdisciplinary perspective integrating research from the fields of epidemiology, physiology, and psychology.

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 Channel Structure, Function and Regulation. 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 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 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 6651. Human Anatomy. 4 Credit Hours.
The study of human system anatomy involving cadaver dissection, lectures and practical exams. The human muscular, nervous, skeletal and cardiorespiratory systems will be emphasized.

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 6746. Rehabilitation Engineering. 3 Credit Hours.
Students will participate in rehabilitation engineering as practiced in the assistive technology industry. Credit not allowed for both APPH 6746 and ME 6746.

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 6896. Lower Limb Orthotics II. 4 Credit Hours.
This course is the second in a two course series and applies more advanced elements of theory, technical design and patient management.

APPH 6971. Introduction to P&O Processes and Clinical Methods. 1 Credit Hour.
This course introduces basic processes for fabrication of prostheses and orthoses. Clinical methods associated with the provision of prostheses and orthoses will also be introduced.

APPH 6975. Introduction to Prosthetics. 2 Credit Hours.
This course introduces the history and development of external limb prostheses including their design, alignment, socket interfaces, suspension mechanisms, and components.

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 6984. Transtibial Prosthetics. 4 Credit Hours.
Clinical training for the practice of prosthetics emphasizing adult and pediatric transtibial (below knee) prostheses.

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. Seminar in Prosthetics and Orthotics. 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 8907. Teaching Assistantship. 1-21 Credit Hours.
This course if for students holding a graduate teaching assistantship.

APPH 8908. Research Assistantship. 1-9 Credit Hours.
For graduate students holding research assistantships.

APPH 9000. Doctoral Thesis. 1-21 Credit Hours.

BIOL 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.

BIOL 1510. Biological Principles. 4 Credit Hours.
An introduction to the basic principles of modern biology, including biomacromolecules, bioenergetics, cell structure, genetics, homeostasis, evolution, and ecological relationships.

BIOL 1511. Honors Biological Principles. 4 Credit Hours.
An advanced introduction to the principles of modern biology, including biomacromolecules, bioenergetics, cell structure, genetics, homeostasis, evolution, and ecological relationships.

BIOL 1520. Introduction to Organismal Biology. 4 Credit Hours.
An introduction to biology at the organ and organismal levels, with emphasis on physiological processes and integration of growth and development.

BIOL 1521. Honors Introduction to Organismal Biology. 4 Credit Hours.
Introduction to biology at the organ and organismal levels, with emphasis on biodiversity, physiological processes, and integration of growth, reproduction and development.

BIOL 1XXX. Biology Elective. 1-21 Credit Hours.

BIOL 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.

BIOL 2335. General 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.

BIOL 2336. General Ecology Laboratory. 1 Credit Hour.
The companion laboratory for BIOL 2335 (Ecology). This course stresses understanding ecological concepts through a combination of lab and field experiments, and computer simulations. 0.

BIOL 2337. Honors Ecology. 3 Credit Hours.
A problem-based learning course in ecology. Student teams will do research and solve challenges typically faced by ecologists and environmental scientists.

BIOL 2338. Honors Ecology Laboratory. 1 Credit Hour.
Companion course to Honors Ecology. Student teams will explore solutions to ecological challenges using experiments and mathematical models.

BIOL 2344. 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.

BIOL 2345. Genetics Laboratory. 1 Credit Hour.
A laboratory course in the fundamental techniques of genetic analysis.
BIOL 2354. Honors Genetics. 3 Credit Hours.
A comprehensive genetics course incorporating discussions of primary literature. Topics include molecular genetics and gene action, transfer systems and mapping, cytological, quantitative and population genetics. Credit not allowed for both BIOL 2354 and BIOL 2344.

BIOL 2355. Honors Genetics Laboratory. 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.

BIOL 2400. Mathematical 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.

BIOL 2694. Intern Assistantship(Undergraduate Internship for Pay). 1-21 Credit Hours.
Biological 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 Biology.

BIOL 2695. Undergraduate Internship(Undergraduate Internship for Academic Credit). 1-21 Credit Hours.
Biological Undergraduate Internship for credit freshmen and sophomores, by permit only. The internship experience must be at a unit or agency approved by the School of Biology.

BIOL 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

BIOL 2699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

BIOL 2801. Special Topics. 1 Credit Hour.
This designation enables the School of Biology to provide new lecture courses dealing with areas of current interest in biological sciences.

BIOL 2802. Special Topics. 2 Credit Hours.
This designation enables the School of Biology to provide new lecture courses dealing with areas of current interest in biological sciences.

BIOL 2803. Special Topics. 3 Credit Hours.
This designation enables the School of Biology to provide new lecture courses dealing with areas of current interest in biological sciences.

BIOL 2804. 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 sciences.

BIOL 2805. Special Topics. 5 Credit Hours.
This designation enables the School of Biology to provide new lecture courses dealing with areas of current interest in biological sciences.

BIOL 2901. Special Problems. 1-21 Credit Hours.
Research problems in biology under the supervision of a faculty member.

BIOL 2902. Special Problems. 1-21 Credit Hours.
Research problems in biology under the supervision of a faculty member.

BIOL 2903. Special Problems. 1-21 Credit Hours.
Research problems in biology under the supervision of a faculty member.

BIOL 2904. Special Problems. 1-21 Credit Hours.
Research problems in biology under the supervision of a faculty member.

BIOL 2905. Special Problems. 1-21 Credit Hours.
Research problems in biology under the supervision of a faculty member.

BIOL 2XX. Biology Elective. 1-21 Credit Hours.

BIOL 3100. Ecology and 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.

BIOL 3300. Tropical Ecology. 3 Credit Hours.
Ecological processes in the tropics including community organizations, biotic interactions, biodiversity, coevolution. Students perform research projects in rain forest, cloud forest, and seashore.

BIOL 3380. Introductory Microbiology. 3 Credit Hours.
Basic biology of bacteria, fungi, algae, and viruses, with emphasis on bacteriology.

BIOL 3381. Introductory Microbiology Laboratory. 1 Credit Hour.
Fundamental laboratory techniques in microbiology.

BIOL 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. Credit not allowed for both BIOL 3450 and BIOL 3340.

BIOL 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. Credit not allowed for both BIOL 3451 and BIOL 3341.

BIOL 3600. Introduction to Evolutionary Biology. 3 Credit Hours.
Comprehensive introduction to evolutionary biology. Includes focus on processes (natural selection, genetic drift) and resulting patterns (genome organization, phylogeny) illustrated with prokaryote and eukaryote examples.

BIOL 3751. Anatomy and Physiology. 3 Credit Hours.
Study of human anatomy and fundamental physiological mechanisms. Topics include nervous, musculoskeletal, and cardiorespiratory systems. Free elective for biology majors. Crosslisted with AP 3751.

BIOL 3753. Fundamentals of 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.

BIOL 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.

BIOL 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.

BIOL 3756. Laboratory in Human Physiology. 1 Credit Hour.
A laboratory application of concepts in Physiology, providing hands-on experience focusing on primarily on non-invasive human experiments supplemented with in vitro tissues experiments.

BIOL 3813. Special Topics. 3 Credit Hours.
Topics of current interest not covered in other courses in the department.
BIOL 3XXX. Biology Elective. 1-21 Credit Hours.

BIOL 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.

BIOL 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. Credit not allowed for both BIOL 4015 and BIOL 7015.

BIOL 4101. Sensory Ecology. 3 Credit Hours.
A quantitative analyses of communication channels and information acquisition involving visual, auditory, mechanosensory, and olfactory modalities across a range of species and habitats.

BIOL 4105. Macromolecular Modeling. 4 Credit Hours.
Principles and practices in the use of molecular mechanics methods (minimization; molecular dynamics) to study structure-function relationships in biological macromolecules.

BIOL 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. Credit not allowed for both BIOL 4150 and BIOL 6150.

BIOL 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.

BIOL 4225. Molecular Evolution. 3 Credit Hours.
Evolutionary processes at 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 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.

BIOL 4401. Experimental Design and Statistical Methods in Biology. 3 Credit Hours.
Introductory course on experimental design, hypothesis testing and basic statistical techniques commonly applied in biological research. Exercises based on computer statistical software packages.

BIOL 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.

BIOL 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. Credit not allowed for both BIOL 4417 and BIOL 6417.

BIOL 4418. Microbial Physiology. 3 Credit Hours.
Study of the physiology of growth and metabolic activities of microorganisms.

BIOL 4422. Theoretical Ecology. 3 Credit Hours.
Theoretical foundations of ecology, from the population to the community and ecosystem levels.

BIOL 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. Credit will not be awarded for both BIOL 4428 and BIOL 6428.

BIOL 4440. Plant Physiology. 3 Credit Hours.
Chemical transformation in photosynthesis, photophysics and water relationships, organic nutrition and effects of hormones on growth and development of plants.

BIOL 4446. General Animal Physiology I. 3 Credit Hours.
Systems physiology including nerves, muscles, kidney, digestion, circulation, endocrinology, reproduction, and respiration.

BIOL 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. Credit will not be awarded for both BIOL 4450 and BIOL 4460.

BIOL 4464. Developmental Biology. 3 Credit Hours.
Investigations of cell differentiation and development using the tools of molecular genetics and cell biology.

BIOL 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.

BIOL 4478. Biophysics. 3 Credit Hours.
Biophysical aspects of nucleic acids, proteins, and their interactions.

BIOL 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. Credit not allowed for both BIOL 4480 and BIOL 6480.

BIOL 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.

BIOL 4570. Immunology and Immunochemistry. 3 Credit Hours.
A survey of modern immunology and its applications.

BIOL 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.

BIOL 4607. 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 not awarded for both BIOL 4607 and BIOL 4608 or BIOL 4607 and BIOL 6608 or BIOL 4607 and BIOL 6607.

BIOL 4608. Prokaryotic Molecular Genetics. 3 Credit Hours.
The molecular genetics of bacteria and their viruses, with emphasis in the organization, replication, expression, transfer and experimental manipulation of prokaryotic genes and genomes. Credit not allowed for both BIOL 4220 and BIOL 4608 or BIOL 4608 and BIOL 4607 or BIOL 4608 and BIOL 6607.
BIOL 4620. Aquatic Chemical Ecology. 3 Credit Hours.
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 4620 and BIOL 6620.

BIOL 4650. Bioethics. 2 Credit Hours.
This course will examine the process of scientific inquiry and the ethical implications of research in the biological sciences.

BIOL 4651. Foundations of 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. Credit not awarded for both BIOL 4651 and BIOL 4650.

BIOL 4668. Eukaryotic Molecular Genetics. 3 Credit Hours.
Topics in molecular genetics, including genetic engineering techniques, gene expression and regulation, genetic structure, stability and evolution, with emphasis on eukaryotic organisms.

BIOL 4690. Independent Research Project. 3 Credit Hours.
Independent research with proposal and manuscript writing, conducted with the guidance of a faculty member.

BIOL 4694. Intern Assistantship(Undergraduate Internship for Pay). 1-21 Credit Hours.
Biology Undergraduate Internship for pay for juniors and seniors, by permit only. The internship experience must at a unit or agency approved by the School of Biology.

BIOL 4695. Undergraduate Internship(Undergraduate Internship for Academic Credit). 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.

BIOL 4696. Biology Undergraduate Teaching Assistantship. 3 Credit Hours.
Biology teaching carried out under the guidance of a faculty member. Credit not allowed for both BIOL 4696 and BIOL 4697.

BIOL 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. Credit not allowed for both BIOL 4696 and BIOL 4697.

BIOL 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

BIOL 4699. Undergraduate Research. 1-12 Credit Hours.
Independent research conducted under the guidance of a faculty member.

BIOL 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 BIOL 4740 and (ISYE 4740 or PTFE 4740 or MSE 4740 or ME 4740).

BIOL 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.

BIOL 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.

BIOL 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 BMED 4752.

BIOL 4755. Mathematical Biology. 3 Credit Hours.
An introduction to practical applications of mathematical models to help unravel the underlying mechanisms involved in biological processes. Crosslisted with MATH 4755.

BIOL 4801. Special Topics. 1 Credit Hour.
This designation enables the School of Biology to provide new lecture courses dealing with areas of current interest in biological science.

BIOL 4802. Special Topics. 2 Credit Hours.
This designation enables the School of Biology to provide new lecture courses dealing with areas of current interest in biological science.

BIOL 4803. Special Topics. 3 Credit Hours.
This designation enables the School of Biology to provide new lecture courses dealing with areas of current interest in biological science.

BIOL 4804. 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.

BIOL 4805. Special Topics. 5 Credit Hours.
This designation enables the School of Biology to provide new lecture courses dealing with areas of current interest in biological science.

BIOL 4813. Special Topics. 3 Credit Hours.
Special Topics in BIOS.

BIOL 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.

BIOL 4823. Special Topics. 3 Credit Hours.
Special Topics in BIOS.

BIOL 4833. Special Topics. 3 Credit Hours.
Special Topics in BIOS. null.

BIOL 4901. Special Problems. 1-21 Credit Hours.
Research problem in biology under supervision of a faculty member. To be offered any term with credit to be arranged. Seven hours (four hours technical electives + three hours free elective) are the maximum credits allowed toward the Bachelor of Science in Biology degree.

BIOL 4902. Special Problems. 1-21 Credit Hours.
Research problem in biology under supervision of a faculty member. To be offered any quarter with credit to be arranged. Seven hours (four hours technical electives + three hours free electives) are the maximum credits allowed toward the Bachelor of Science in Biology degree.

BIOL 4903. Special Problems. 1-21 Credit Hours.
Research problem in biology under supervision of a faculty member. To be offered any quarter with credit to be arranged. Seven hours (four hours technical electives + three hours free electives) are the maximum credits allowed toward the Bachelor of Science in Biology degree.

BIOL 4904. Special Problems. 1-21 Credit Hours.
Research problem in biology under supervision of a faculty member. To be offered any quarter with credit to be arranged. Seven hours (four hours technical electives + three hours free electives) are the maximum credits allowed toward the Bachelor of Science in Biology degree.
BIOL 4905. Special Problems. 1-21 Credit Hours.
Special problem in biology under supervision of a faculty member. To be offered any quarter with credit to be arranged. Seven hours (four hours technical electives + three hours free electives) are the maximum credits allowed toward the Bachelor of Science in Biology degree.

BIOL 4910. Honors Undergraduate Research Thesis. 3 Credit Hours.
Writing and submission of an Undergraduate Research Thesis describing research accomplishments with a Georgia Tech faculty member. For a thesis conducted without a Biological Sciences faculty member, the instructor of record and a second reader from the School must both approve the thesis contains sufficient biological content.

BIOL 4XXX. Biology Elective. 1-21 Credit Hours.

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 6422. Theoretical Ecology. 3 Credit Hours.
Theoretical foundations of ecology, from the population to the community and ecosystem levels.

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 6480. 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. Credit not allowed for both BIOL 6480 and BIOL 4480.

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 6608. Advanced Microbial Genetics. 3 Credit Hours.
Molecular mechanisms of bacterial and plasmid genetic processes. Topics covered include genome organization, DNA replication, transcription, and translation. Credit will not be awarded for both BIOL 6608 and BIOL 4607 or BIOL 6608 and BIOL 6607.

BIOL 6611. Advanced Microbial Physiology. 3 Credit Hours.
Advanced studies of selected aspects of the physiology 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 6623. Experiments in Aquatic Chemical Signaling. 6 Credit Hours.
A full-time commitment to student-originated, but faculty-guided, interdisciplinary research in aquatic chemical signaling using field, lab, and flume facilities at Skidaway Institute of Oceanography on the coast.

BIOL 6626. Physiological Ecology. 3 Credit Hours.
Study of the basic physiological processes and systems in vertebrates and invertebrates. Comparative study on how these systems are adapted for specific environments and functions.

BIOL 6628. Aquatic Toxicology. 3 Credit Hours.
Study of the biological effects of toxicants on aquatic organisms—mechanisms of toxicity, biotransformation, toxicity tests, ecological risk assessment.

BIOL 6630. Advanced Microbial Ecology. 3 Credit Hours.
Advanced studies of selected aspects of the ecology of prokaryotic and eukaryotic organisms.

BIOL 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.

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 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 eukaryotic 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 7023. Bioinformatics. 3 Credit Hours.
Introduction to mathematical, statistical, and computer methods of nucleic acid and protein sequence analysis and interpretation. Algorithms for gene finding, protein structure and function prediction, constructing phylogenetic trees.

BIOL 7101. Advanced Sensory Ecology. 3 Credit Hours.
A quantitative analysis of how organisms of all kinds obtain information about their environment, and how they use it to guide locomotions.

BIOL 7110. Macromolecular Modeling. 4 Credit Hours.
Principles and practices in the use of molecular mechanics methods (minimization: molecular dynamics) to study structure-function relationships in biological macromolecules.

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 7668. Eucaryotic Molecular Genetics. 3 Credit Hours.
Topics in molecular genetics of eukaryotic organisms, including: gene structure and expression, protein processing and folding, genome stability, and molecular evolution.

BIOL 7913. Advances in Microbiology. 2 Credit Hours.
Topics of current interest in microbial physiology, applied microbiology, microbial ecology, and medical microbiology.

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 8000. Integrative Biology Seminar. 2 Credit Hours.
A reading and discussion course structured around the School of Biology weekly seminar.

BIOL 8001. Seminar. 2 Credit Hours.
Presentation of research seminar.

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 8005. Signals in the Sea Seminar. 2 Credit Hours.
Students and invited authorities in the field will present seminars and lead discussions focused on currently emerging topics in aquatic chemical ecology and signaling.

BIOL 8006. Integrative Approaches to Biological Systems. 2 Credit Hours.
This course will investigate, using samples from the literature and faculty research, the general principles of biological systems, from gene expression circuits to ecological communities.

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 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.
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.