

# 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](http://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

### 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 APPH 1040.

### 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.

### 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 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 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 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-excitabile 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 is 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.****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 1510R. BIOL 1510 Recitation. 0 Credit Hours.**

A recitation period for BIOL 1510, an introduction to the basic principles of modern biology, including biomacromolecules, bioenergetics, cell structure, genetics, 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 2695. Undergraduate Internship(Undergraduate Internship for Academic Credit). 1-21 Credit Hours.**

Biology 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 2XXX. 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 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 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 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 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 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 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 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 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 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 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 4823. Special Topics. 3 Credit Hours.**

Special Topics in BIOS.

**BIOL 4833. Special Topics. 3 Credit Hours.**

Special Topics in BIOS.

**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 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 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 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 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 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 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 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 Biotechnology. 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.****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.**

An 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 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 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. 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 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 4XXX. Biological Sciences Elective. 1-21 Credit Hours.****BIOS 8802. Special Topics. 2 Credit Hours.**