Department of Biology

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The Department of Biology has two programs of courses–one leading to a Bachelor of Science degree with a major in biology and one to a Bachelor of Arts degree with a major in biology. In addition, the Master of Science with a major in biology is also offered. The department also participates in several pre-professional programs such as pre-dental hygiene, pre-occupational therapy, pre-physical therapy, pre-respiratory therapy, pre-optometry, and medical technology.

Biology is the study of life and represents one of the most dynamic disciplines in science. The courses offered encompass a wide range of subject matter, from cellular to organismal studies. A large selection of courses emphasizing principles and concepts allows students to concentrate in a number of subdivisions of biology. The structuring of core and elective courses in the biology program is designed to prepare students for employment in biology-related positions, as well as for advanced study in graduate school, including biology, medicine, dentistry, veterinary science, and allied health fields.

The department also participates in several two-year professional programs. Upon completion of these two-year programs, the student may qualify for an Associate of Arts degree.

Selected Educational Outcomes

The programs of study in the Department of Biology have numerous desired outcomes. Examples of these outcomes include the following:

1. Develop and test hypotheses, collect and analyze data, and present the results and conclusions in both written and oral formats used in peer-reviewed journals and at scientific meetings.
2. Describe the evolutionary processes responsible for biological diversity, explain the phylogenetic relationships among the major taxa of life, and provide illustrative examples.
3. Demonstrate an understanding of the cellular basis of life.
4. Relate the structure and the function of DNA/RNA to the development of form and function of the organism and to heredity.
5. Interpret ecological data pertaining to the behavior of the individual organism in its natural environment; to the structure and function of populations, communities, and ecosystems; and to human impacts on these systems and the environment.

Examples of Outcome Assessments

The Department of Biology assesses the extent to which the programs' requirements create the desired outcomes by using a variety of techniques. Examples of these assessments include the following:

1. Regular advising and evaluation of a student's academic progress are made each semester.
2. So that students possess a good foundation in basic biological principles before taking required and elective Senior College courses in biology, their academic progress in Area F core courses is monitored to ensure that they have achieved a minimum grade of "C" in biology courses applied to the major.
3. Senior Seminar, the capstone course, is used to
   a. assess the understanding of advanced concepts and principles in biology and breadth of knowledge in key areas using the Major Field Test in biology
   b. evaluate students' ability to write scientifically correct reports and engage in knowledgeable discourse and debate with peers and faculty
   c. administer an exit survey for program evaluation.

- Bachelor of Arts with a Major in Biology (http://catalog.valdosta.edu/archive/2024-2025/undergraduate/academic-programs/sciences-mathematics/biology/ba-biology/)
- Bachelor of Science with a Major in Biology (http://catalog.valdosta.edu/archive/2024-2025/undergraduate/academic-programs/sciences-mathematics/biology/bs-biology/)
- Minor in Biology (http://catalog.valdosta.edu/archive/2024-2025/undergraduate/academic-programs/sciences-mathematics/biology/minor-biology/)

BIOL 1010. Introduction to Biology: The Evolution and Diversity of Life. 3 Hours.
This course cannot be taken for credit toward the major in biology. An introduction to the diversity of life on Earth with a special emphasis on ecological and evolutionary processes and relationships.

BIOL 1011K. Introduction to Biology. 4 Hours.
An introduction to fundamental unifying principles in biology. Topics covered in the course include: chemistry of life, cell structure and membranes, cellular functions (metabolism, respiration, photosynthesis, communication, and reproduction), genetics (inheritance patterns, DNA structure and function, gene expression, and biotechnology), and evolution. This course involves both lecture and lab components.

BIOL 1012K. Introductory to Biology II. 4 Hours.
This course covers the evolution and diversity of organisms, including microbes, protists, fungi, plants, and animals. Additional topics include body systems, the immune system, reproduction and development, and ecology. For non-biology majors only.

BIOL 1020L. Biodiversity Lab. 1 Hour.
This course cannot be taken for credit toward the major in biology. A laboratory course to accompany Biology 1010 emphasizing the diversity of life.

BIOL 1030. Introduction to Biology: Organismal Biology. 3 Hours.
This course cannot be taken for credit toward the major in biology. An introduction to modern biology for the non-major with special emphasis on the processes involved in the development and maintenance of complex multicellular organisms.

BIOL 1040L. Organismal Biology Lab. 1 Hour.
This course cannot be taken for credit toward the major in biology. A laboratory course to accompany Biology 1030, emphasizing the structure of multicellular organisms.

BIOL 1050. Human Biology. 3 Hours.
An introduction to the processes underlying the interactions of humans and the natural world. The topics to be covered include: physiological processes and their relationship to diseases; human genetics and biotechnology; the evolutionary basis of human structure and behavior, and the impact of humans on natural communities.

BIOL 1080. Conservation Biology. 3 Hours.
Basic biology underlying current issues in the conservation of rare species, native ecosystems, and biological diversity in general. Exploration of the nature and geographic distribution of biodiversity and threats to it, discussed in the context of ecological and population-genetic principles as well as socio-economic and political realities. Theory and case studies of different modes of preserving biodiversity (zoos and gardens vs. natural preserves) will be presented. The U.S. Endangered Species Act and Wilderness Preservation Act and C.I.T.E.S., among others, will be critically evaluated as models for government involvement in conservation. Prescriptions for sustainable development that does not further erode biodiversity will be discussed in light of current knowledge of genetics, population dynamics, and community and landscape ecology.

BIOL 1100. Biology Freshmen Seminar - Introduction to the Biological Sciences. 1 Hour.
Pre- or corequisite for biology majors: BIOL 1107K. An introduction to college-level science and specifically the field of the biological sciences. Topics covered will include strategies for success, basic descriptive statistics and data analysis, exposure to possible careers within the field, professional ethics, and resource and library use. Some evening sessions will be required during the semester.

BIOL 1107. Principles of Biology I. 3 Hours.
Prerequisites: Co-requisite: BIOL 1107L and for biology majors, BIOL 1100. An introduction to the principles of biology for science majors, with an emphasis on the cellular nature of life. Concepts covered include the origin and early evolution of cellular life; cell structure, function, metabolism, and reproduction; cell structure, function, metabolism, and reproduction; cell signaling; and gene regulation in bacteria and eukaryotes.

BIOL 1107L. Principles of Biology Laboratory I. 1 Hour.
Pre- or Co-requisite: BIOL 1107. A laboratory course to accompany BIOL 1107, with exercises dealing with the cellular nature of life.

BIOL 1108. Principles of Biology II. 3 Hours.
Prerequisite: BIOL 1107 and 1107L or permission of instructor. Co-requisite: BIOL 1108L. An introduction to physiological processes in plants and animals. Structure, nutrition, transport, coordination, reproduction, and development will be addressed.

BIOL 1108L. Principles of Biology Laboratory II. 1 Hour.
Prerequisites: BIOL 1107 and 1107L or permission of the instructor. Co-requisite: BIOL 1108. A laboratory course to accompany BIOL 1108, with exercises dealing with anatomy and physiology of plants and animals.

BIOL 1200. History of the Life Sciences. 3 Hours.
An introduction to the history and philosophy of biology and related sciences. The development and evolution of major theories and techniques of science and interactions between science and culture will be emphasized.

BIOL 1951H. Honors Biology: Cellular Processes. 4 Hours.
An introduction to the fundamental principles of cell and molecular biology. Prokaryotic and eukaryotic development will focus on the relationship of structure and function. Cellular solutions to fundamental problems such as cell recognition, energy acquisition and conversion, genetic transmission, and cellular reproduction will be discussed. Taught in an enriched, discussion, and project-oriented classroom environment.

BIOL 1952H. Honors Biology: The Evolution and Diversity of Life. 4 Hours.
Introduction to modern biology with an emphasis on the diversity of life on Earth and a close examination of ecological and evolutionary processes and relationships. Taught in an enriched, discussion and project-oriented classroom environment.

BIOL 2251K. Human Anatomy and Physiology I. 4 Hours.
This integrated lecture and laboratory course is the first course in a two-semester sequence designed to explore the biological and chemical processes underlying the structure and function of the human body at the cellular, tissue, organ, and whole-body level Topics to be covered include, but are not limited to, biological chemistry; cellular structure and function; tissues; and the integumentary, skeletal, muscular, and nervous systems. This course includes laboratory exercises that supplement the material covered in lectures. This course is designed primarily for non-biology majors, especially those pursuing majors in nursing and the allied health professions.

BIOL 2252K. Human Anatomy and Physiology II. 4 Hours.
Prerequisite: BIOL 2251K. This lecture and laboratory course is the second course in a two-semester sequence designed to explore the biological and chemical processes underlying the structure and function of the human body at the cellular, tissue, organ, and whole-body level. Topics to be covered include, but are not limited to, the cardiovascular, endocrine, lymphatic and immune, respiratory, digestive, urinary, and reproductive systems. Metabolism and fluid, electrolyte, and acid-base balance will also be covered. This course is designed primarily for non-biology majors, especially those pursuing majors in nursing and the allied health professions.

BIOL 2260K. Foundations in Microbiology. 4 Hours.
This integrated lecture and laboratory course provides an introduction to microbiology. This course introduces the student to the diversity and classification of medically significant microorganisms, their modes of pathogenesis and transmission, and the infectious diseases they cause. Topics to be covered include, but are not limited to, microbial cell biology and genetics; major classes of disease-causing microorganisms; host immune response; microbial control; aseptic techniques; disinfection; and isolation, culture, staining, and identification of microorganisms. Select laboratory exercises will provide training in the basic laboratory techniques for culture and identification of microbes. This course is designed primarily for non-biology majors, especially those pursuing majors in nursing and the allied health professions.

BIOL 2950. Directed Research. 1-4 Hours.
Supervised research on a specific biological question and preparation of a final report agreed upon by student and instructor. A maximum of 12 credit hours may be taken, and they can only be applied toward the general elective requirements for biology majors.

BIOL 3000. Biostatistics. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, 1108L, MATH 1112 or 1113, MATH 1401. Recommended: CS 1010 or CS 1301. An introduction to univariate and multivariate analysis of biological data, with emphasis on parameter estimation, hypothesis testing, and statistical programming.

BIOL 3050. Spatial Analysis. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, 1108L, and MATH 1401 or permission of instructor. Recommended: BIOL 3000 and BIOL 3250. A survey of key concepts and methods for the statistical analysis of spatial data sets, designed for environmental and life sciences but open to all relevant disciplines.

BIOL 3100. Microbiology. 4 Hours.
Prerequisites: BIOL 1107, 1107l, BIOL 1108, 1108L, BIOL 3200, CHEM 1211/1211L, CHEM 1212/1212L. Recommended: CHEM 3402. Survey of microbiology covering eubacteria, archaebacteria, protozoa, fungi, algae, and viruses. Includes fundamental techniques, microbial physiology and genetics, biotechnology, medical applications, and applied microbiology. Two 1.5 hour laboratory periods per week.

BIOL 3200. Introductory Genetics. 3 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, 1108L, and MATH 1112 or MATH 1113; or permission of instructor. A survey of modern genetics, including Mendelian modes of heredity, extensions and variations on Mendelian genetics, chromosomal inheritance and variation, molecular properties of genes, and basic quantification of genetic diversity at the population level.

BIOL 3250. Ecology and Evolution. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, 1108L, and BIOL 3200. An introduction to major topics in ecology and evolution, including population, community, and ecosystem ecology; Darwinian theory of evolution through natural selection; microevolution and macroevolution. Computer and field labs will provide exposure to both evolutionary theory and field ecology.

BIOL 3300. Ecology. 4 Hours.
Prerequisites: BIOL 2230, BIOL 2270, CHEM 1212/1212L, with a grade of “C” or better. Corequisite: BIOL 3200 or consent of instructor. Basic ecological principles including behavior of individuals, populations, and communities in the context of their physical and biotic environments. Reviews population genetics and basic evolution; emphasizes scientific method, including the role of theory, hypothesis testing, statistical analysis and scientific writing. Observation and data collection mostly in the field within a variety of local ecosystems. One weekend field trip required.

BIOL 3350. Environmental Science. 3 Hours.
Prerequisites: BIOL 1107, 1107L, 1108, 1108L, 3200, 3250, CHEM 1211/1211L and 1212/1212L; or completion of Area D in core; or permission of instructor. An overview of relevant environmental issues. Topics discussed will include environmental pollution, global climate change, threatened and endangered species, introduced and invasive species, and sustainability.

BIOL 3400. Plant Physiology and Biotechnology. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, 1108L, BIOL 3200, CHEM 1211/1211L, CHEM 1212/1212L. The physiology of plants under changing environments. Additionally, this course will provide students with training in current plant biotechnology tools.

BIOL 3450. Animal Physiology. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, 1108L, BIOL 3200, CHEM 1211/1211L, CHEM 1212/1212L. A study of the fundamental processes of physiological systems in animals from the molecular to the organismal levels of organization.

BIOL 3460. Human Physiology. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, 1108L, BIOL 3200, CHEM 1211/1211L, CHEM 1212/1212L. Human physiological principles, from cells to systems, with emphasis on the regulation and integration of organ systems.

BIOL 3500. Mycology. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, 1108L; Recommended: BIOL 3100. Biology of fungi with emphasis on morphology, taxonomy, physiology, and ecology, includes the roles of fungi as both beneficial organisms and as causal agents in plant and animal diseases.

BIOL 3530. Biodiversity of Macrofungi. 4 Hours.
Prerequisites: BIOL 1107K and 1108K, or permission of the instructor. A survey of the biology and diversity of fungi that produce mushrooms or large ascocarps, with an emphasis on identification in the laboratory. Field trips may be required.

BIOL 3550. Phycology. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, 1108L. An introduction to the study of the algae, including taxonomy, phylogeny, physiology, and ecology. Laboratories will focus on the examination of live material, and will include methods for the isolation and culture of algae.

BIOL 3600. Local Flora. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, and 1108L. A field-oriented study emphasizing identification, distribution, and ecology of locally occurring seed-bearing plants. Two or three weekend field trips are routinely scheduled.

BIOL 3601L. Laboratory Techniques in Biochemistry. 2 Hours.
Corequisite or Prerequisite: CHEM 3601. Experiments to illustrate the principles and research techniques in biochemistry and molecular biology.

BIOL 3602. Biochemistry II. 3 Hours.
Prerequisite: CHEM 3601 with a grade of "C" or better. A continuation of CHEM 3601. Comprehensive disussion of regulatory, metabolic and biosynthetic pathways, advanced enzyme kinetics, regulation of gene expression, and recombinant DNA technology.

BIOL 3610. Dendrology. 4 Hours.
Prerequisite: Completion of Core Area “D.” A survey of the biology and diversity of trees and of the major forest communities. The course will emphasize species of the southeastern United States and forest communities of North America, including field identification, description and classification of forest communities, and a study of reproductive cycles, anatomy, and development of representative species. Field trips may be required.

BIOL 3630. Biology of Horticulture. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, and 1108L or permission of the instructor. Introduction to the biological principles and practices of propagating and growing plants.

BIOL 3650. Plant Systematics. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, and 1108L. A survey of the principles of plant systematics that includes identification, nomenclature, evolution, and classification within the plant kingdom, and a systematic survey of plant families, with emphasis on local representatives.

BIOL 3680. Plant Pathology. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, 1108L, BIOL 3200, and BIOL 3250; or permission of the instructor. Study of plant diseases, with emphasis on disease etiology, pathogenesis, ecology of host/pathogen interactions, epidemiology, and strategies for disease control.

BIOL 3700. Neuroscience. 3 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, and 1108L. An exploration of the human nervous system based upon current experimental models. The course will be divided into four areas: neural signaling, sensory input, motor input, and modifications of neuronal circuits. The neurobiology of disease will be emphasized.

BIOL 3800. Invertebrate Zoology. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, and 1108L. A study of the morphology, phylogeny, and ecology of invertebrates.

BIOL 3810. Introduction to Biogeography. 3 Hours.
Also offered as GEOG 3810. Prerequisites: Three of the following courses: GEOG 1112K, GEOG 1113K, BIOL 1107, 1107L, BIOL 1108, and 1108L. An overview of factors controlling the distribution of plants and animals on the Earth. Topics discussed include ecological and evolutionary processes, geophysical and climatic phenomena, and historical and anthropogenic events that have influenced current distributions.

BIOL 3820. Vertebrate Zoology. 4 Hours.
Prerequisites: BIOL 1107, 1107L BIOL 1108, and 1108L or permission of the instructor. An integrated approach to the study of chordates, including their classification, evolution, morphology, physiology, ecology, and behavior.

BIOL 3830. Marine Biology. 3 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108 and 1108L. BIOL 3250 Recommended. An examination of coastal and oceanic organisms and the factors which structure marine systems.

BIOL 3840. Entomology. 4 Hours.
Prerequisites: BIOL 1107, 1107L BIOL 1108, and 1108L. Introduction to the study of insect biology including ecology, behavior, and taxonomy. Laboratory includes field observation, sampling and identification of local fauna.

BIOL 3850. Medical and Veterinary Entomology. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108 and 1108L or permission of the instructor. Overview of medical and veterinary entomology. The course reviews basic biology of insects and other arthropods, with emphasis on species affecting health of humans, domestic animals, and livestock. Diseases associated with arthropods and principles of forensic entomology will be considered.

BIOL 3860. Biology of Emerging Infectious Diseases. 3 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, 1108L, and BIOL 3200 or permission of instructor. An overview of emerging human infectious diseases with a special emphasis on biological factors impacting their transmission and control.

BIOL 3870. Parasitology. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, and 1108L. A study of the morphology, life cycles, and host-parasite relationships of representative protozoan and metazoan parasites. Human parasites are emphasized.

BIOL 3900. Ichthyology. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, and 1108L. A study of the taxonomy, distribution, ecology, behavior and evolution of freshwater and marine fishes. One or two overnight field trips on weekends will be scheduled, with emphasis placed on the collection and preservation of specimens and the identification of habitats occupied by various species. Other field trips scheduled during normal laboratory periods.

BIOL 3920. Herpetology. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, and 1108L. Introduction to the study of amphibians and reptiles, including anatomy, physiology, ecology, behavior, and classification coordinated with field study of local species.

BIOL 3950. Ornithology. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, and 1108L. Lectures on morphology, evolution, ecology, behavior, and distribution of birds of the world. Lab emphasizes gross anatomy and identification of local species by sight and sound; mostly in the field. Five-day field trip to south Florida required; other Saturday trips offered.

BIOL 3960. Wildlife Biology. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, 1108L, BIOL 3200, BIOL 3250. General principles and techniques of wildlife conservation, ecology, and management, with an emphasis on life histories and taxonomy of game species of the southeastern United States.

BIOL 3970. Wildlife Diseases. 3 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, 1108L, BIOL 3200, and BIOL 3250. An introduction to the field of wildlife disease biology. Topics examined will include specific avian, mammalian, reptilian, and amphibian diseases as well as methods to survey for, recognize, and diagnose diseases. Information concerning biosafety, biosecurity, proper permitting, and working with the public will be presented.

BIOL 3980. Mammalogy. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, and 1108L. Lectures emphasize morphology, evolution, ecology, zoogeography and classification of mammals of the world. Lab emphasizes gross anatomy and identification of mammal specimens, especially those found in North America. Four-day field trip to Blue Ridge Mountains (NC) required; Manatee dive (FL) offered.

BIOL 4000. Topics in Biology I. 3 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, 1108L, BIOL 3200, and 3250. Selected topics in the biological sciences. May be repeated if the topic is different. This course does not include a laboratory.

BIOL 4010. Topics in Biology II. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, 1108L, BIOL 3200, and 3250. Selected topics in the biological sciences. May be repeated if the topic is different. This course includes a laboratory.

BIOL 4020. Topics in Conservation Biology. 2-4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, 1108L, BIOL 3200 and 3250. Theory, practice, and/or societal/legal/political issues relating to the conservation of various taxonomic groups, habitats and ecosystems, especially those impacted by anthropogenic or other environmental processes. Course may be offered with or without a laboratory component.

BIOL 4100. Morphology of Land Plants. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, and 1108L. Study of vegetative organization and reproductive cycles of bryophytes, pteridophytes and seed plants, which incorporates phylogenetic and ecological relationships.

BIOL 4200. Plant Anatomy. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, and 1108L. Origin and development of tissues and organs of vascular plants. The laboratory stresses microtechnique including preparation of plant tissues in paraffin and plastic resins, sectioning, staining for specific components of plant tissues, and use of different optical methods.

BIOL 4250. Human Anatomy. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, and 1108L, and BIOL 3200, or permission of instructor. Study of the structure of the human body, from cells to organ systems. Major human organ systems such as the integumentary, skeletal, muscular, nervous, cardiovascular, respiratory, digestive, urinary, and reproductive will be surveyed with emphasis on form-function relationships.

BIOL 4300. Comparative Vertebrate Anatomy. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108 and 1108L. Anatomical and phylogenetic survey of representative vertebrate animals.

BIOL 4350. Developmental Biology. 4 Hours.
Prerequisites: BIOL 1107, 1108L, BIOL 1108, 1108L, and BIOL 3200. A study of development from fertilization through embryological stages, with an emphasis placed on experimental embryology and molecular genetic mechanisms in selected model organisms.

BIOL 4400. Vertebrate Histology. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, and 1108L, and 8 semester hours of senior college biology courses. Study of vertebrate histology with emphasis on the four primary tissues (epithelium, connective, muscle, and nerve). Laboratory work consists primarily of detailed microscopic study and drawings of tissues from prepared slides. Two 2-hour laboratory periods per week.

BIOL 4450. Theory and Practice of Scanning Electron Microscopy. 4 Hours.
Prerequisites: BIOL 3200 and 3250 or consent of the instructor. General principles of scanning electron microscopy operation and theory, with comparison to light optics in a laboratory-intensive environment. Topics include fixation and preparation of samples for standard, low voltage, low vacuum, and high resolution SEM.

BIOL 4500. Cell Biology. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, 1108L, BIOL 3200, CHEM 1211/1211L, CHEM 1212/1212L. The organization and function of cellular structures in animal, plant, and microbial systems. Emphasis on the molecular basis of metabolism, transport, mobility, nerve conduction, and the cell cycle.

BIOL 4510. Virology. 3 Hours.
Prerequisites: BIOL 1107, and 1107L, BIOL 1108, 1108L, and BIOL 3100. An introduction to viruses and other non-cellular infectious agents. Topics include the structure and composition of these agents, their replication, effects on their host, and host responses. Methods for studying these agents, their origins and evolution, and their uses in biotechnology will also be discussed.

BIOL 4520. Molecular Biophysics. 3 Hours.
Prerequisite: MATH 2261, BIOL 1107, 1107L, BIOL 1108, 1108L, BIOL 3200, BIOL 3250, CHEM 1211, CHEM 1211L, CHEM 1212, CHEM 1212L, and either PHYS 1111K or PHYS 2211K or consent of the instructor. Introduction to thermodynamics, kinetics and their applications to biological systems.

BIOL 4530. Comparative Biomechanics. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, 1108L or instructor permission, and PHYS 1111K or PHYS 2211K. The application of engineering and physics principles to understand how aquatic, terrestrial and aerial organisms function. Integrated lectures and labs explore the limitations and opportunities the physical world provides to organisms. Some topics include; fly flight, bone breakage, tendon/muscle function, and biomimetic design.

BIOL 4540. Bioinformatics. 3 Hours.
Prerequisite: BIOL 1107, 1107L, BIOL 1108, 1108L, and BIOL 3200 or permission of the instructor. The theoretical principles underlying bioinformatics analysis and hands-on analysis using publicly available databases and software. Additional topics such as epigenetics or systems biology could be included.

BIOL 4550. Immunology. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, 1108L, and BIOL 3100. Basic concepts of immunology, including antigen and antibody structure, the generation of diversity, the nature of T cell and B cell receptors, cellular cooperation, and the down regulation of immune responses.

BIOL 4560. Quantum Biology. 3 Hours.
Prerequisites: A grade of "C" or better in MATH 2261, BIOL 1107, BIOL 1107L, BIOL 1108, 1108L, BIOL 3200, CHEM 1211, CHEM 1211L, CHEM 1212, CHEM 1212L, and either PHYS 1111K or PHYS 2211K or consent of the instructor. A study of the role of quantum mechanics in biological and biochemical phenomena. Basic concepts in quantum aspects of nature will reviewed and their implications in biology will be examined.

BIOL 4580. Molecular Genetics. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108. 1108L, BIOL 3200. The study of the molecular nature of eukaryotic genomes, with emphasis on biotechnology. The lecture will focus on using modern molecular genetic techniques as a means to understanding complex eukaryotic genomes. Emphasis will be placed on reading current, relevant scientific literature. The laboratory will involve hands-on experience in which the student will learn the latest technology of molecular genetic analysis and manipulation.

BIOL 4590. Laboratory Techniques in Biotechnology. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, 1108L, and BIOL 3200. A hands-on laboratory-intensive course with lecture on fundamental and advanced biotechnological tools. This course is tailored to provide students with extensive training for future research participation at the undergraduate and graduate level and for jobs in the biotechnological and phamaceutical industries.

BIOL 4600. Evolution. 3 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, 1108L, and BIOL 3200. Study of the theoretical aspects and the patterns and processes of micro- and macro-evolutionary change.

BIOL 4650. Animal Behavior. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, 1108L, BIOL 3200, BIOL 3250. Introduction to the major concepts of causation, development, evolution, and ecology of animal behavior, emphasizing the behavior of social animals.

BIOL 4700. Limnology. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, and 1108L. A study of the physical, chemical, and biological aspects of fresh waters.

BIOL 4710. Aquatic Toxicology. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, 1108L, BIOL 3200, CHEM 1211/1211L, CHEM 1212/1212L. An examination of different classes of contaminants in aquatic environments and their interactions with aquatic organisms. Methods of toxicity testing, contaminant effects at different levels of biological organization, and environmental regulations will be discussed. The students will use the knowledge they acquire in lecture to conduct toxicity experiments with several different organisms, following EPA protocols. Statistical methods will be used to analyze collected data, and the results will be interpreted.

BIOL 4720. Stream Ecology. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, 1108L, BIOL 3200, and BIOL 3250 or permission of instructor. An overview of the stream ecosystem with emphasis on the interaction between abiotic (flow, temperature, carbon, nutrients, habitat) and biotic (fish, macroinvertebrates, microbes, primary producers) factors.

BIOL 4730. Climate Change Biology. 3 Hours.
Prerequisites; BIOL 1107, 1107L and BIOL 1108, 1108L; or BIOL 1107, and 1107L or BIOL 1108, and 1108L and GEOG 3150 or permission of the instructor. An overview of climate mechanisms and the responses of past and present biological organisms to climate change.

BIOL 4750. Population Biology. 3 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, 1108L, BIOL 3200, BIOL 3250, MATH 2261. Prerequisite or corequisite: BIOL 3300. A review of the theory and applications of population biology, including single-species population growth models (exponential, geometric, logistic, life tables, state and age-structured matrix models, metapopulation models), population genetics models, and multi-species interaction models (competition, predator-prey, succession, and parasite-host). Integrated computer exercises will allow students to manipulate model parameters and understand model predictions and dynamics.

BIOL 4800. Protein Biochemistry. 4 Hours.
Prerequisites: BIOL 1107, 1107L, BIOL 1108, 1108L, BIOL 3200, CHEM 1211/1211L, CHEM 1212/1212L. The structure and function of proteins, with emphasis on properties of amino acids, protein folding, protein-protein and protein-ligand interactions, enzyme kinetics, and enzyme regulation.

BIOL 4830. Laboratory Practicum I. 1 Hour.
Prerequisites: 12 hours of upper division biology and a GPA of 3.0. Graded “Satisfactory” or “Unsatisfactory.” Individualized instruction and practice in assisting with the operation of biology laboratory exercises in classes that have one laboratory period per week. The student is assigned to one class section for one semester and is expected to assist with all class laboratories. The practicum is directed by the instructor of the class to which the student is assigned. Credits may not be used as biology electives.

BIOL 4840. Laboratory Practicum II. 2 Hours.
Prerequisites: 12 hours of upper division biology and a GPA of 3.0. Graded “Satisfactory” or “Unsatisfactory.” Individualized instruction and practice in assisting with the operation of biology laboratory exercises in classes that have two or more laboratory periods per week. The student is assigned to one class section for one semester and is expected to assist with all class laboratories. The practicum is directed by the instructor of the class to which the student is assigned. Credits may not be used as biology electives.

BIOL 4850. Biology Internship. 3 Hours.
Graded “Satisfactory” or “Unsatisfactory.” Open to students who qualify for internship programs in the biological sciences. Credit hours and internship hours granted are agreed on cooperatively by the Biology Department and the internship supervisor and are dependent on the nature of the program and academic work experience. Approval forms must be completed before registration. Grade (Satisfactory/Unsatisfactory) is assigned after submission of written report detailing the work done along with conclusion and evaluation. Only hours of internship credit may be applied toward graduation requirements. Credits may not be used as biology electives.

BIOL 4900. Senior Seminar. 1 Hour.
Pre- or Corequisite: Completion of all required courses in the senior curriculum for the biology major. Graded “Satisfactory” or “Unsatisfactory”. The capstone course in biology. Students are required to attend outside lectures chosen by the instructor. This course assesses students’ ability to research independently topics in biology, assimilate the information, and disseminate the information in an organized and understandable fashion in both written and oral forms. Besides demonstrating comprehension of their topic and competence in communication skills, students take the ETS Major Field test in biology and complete the departmental Senior Exit Questionnaire for successful course completion.

BIOL 4950. Directed Study. 1-4 Hours.
Prerequisite: completion of at least 11 hours of upper-division biology courses with the consent of the instructor and the Department Head. Supervised investigation of a specific problem and preparation of a final report agreed upon by student and instructor. A maximum of three hours of credit may be applied toward the upper-division biology electives requirements; additional credits may count as free electives.