

# Department of Biology

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*2035 Bailey Science Center*

The Department of Biology at Valdosta State University offers a Master of Science degree with a major in biology for students who wish to continue their study of biological science, biological technologies, and related sub-disciplines. This is a research, thesis-based degree. The Biology Department does not offer a non-thesis option. Because there are only a minimal number of specifically required courses in the program, students may, in consultation with their advisors, develop a program of study individually tailored to accommodate their special interests and career goals. Students earning a Master of Science with a major in biology are well prepared for a number of careers and further educational programs. These include doctoral studies, job markets in college and secondary school teaching as well as innumerable biology and biotechnology or medical fields.

The Biology Department of VSU expects its graduate students to acquire the following: A breadth of knowledge appropriate to a master's level of competence in the biological sub-disciplines of cell and molecular biology, genetics, organismal biology, and evolution and ecology a knowledge base that will permit students to identify significant biological research questions, develop protocols to solve problems, and properly analyze and resolve research questions through the use of the scientific method. The Biology Department's admission policies, degree offerings, degree options, and course offerings are designed to help all students achieve these goals.

Master of Science with a Major in Biology (<http://catalog.valdosta.edu/archive/2023-2024/graduate/graduate-degree-programs/sciences-mathematics/biology/ms-biology/>)

## **BIOL 5000. Biostatistics. 4 Hours.**

Prerequisites: Admission to the graduate program or permission of the instructor. An introduction to univariate and multivariate analysis of biological data, with emphasis on parameter estimation, hypothesis testing, and statistical programming.

## **BIOL 5050. Spatial Analysis. 4 Hours.**

Prerequisite: Admission to the graduate school. Recommended: BIOL 5000. 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 5100. Microbiology. 4 Hours.**

Prerequisite: Admission into the graduate program or permission of the instructor. Survey of microbiology covering eubacteria, archaeobacteria, 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 5200. Genetics. 4 Hours.**

Prerequisite: Admission into the graduate program or permission of the instructor. A survey of modern genetics including: Mendelian and molecular genetics, as well as selected topics in population and quantitative genetics and genetic engineering. Laboratory will emphasize genetic analysis using live *Drosophila* and computer simulated crosses, chi-square analysis of progeny data, and application of these principles to laboratory analysis of genetic variation at the DNA level.

## **BIOL 5300. Ecology. 4 Hours.**

Prerequisite: Admission into the graduate program or permission of the 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 5400. Plant Physiology and Biotechnology. 4 Hours.**

Prerequisites: Admission into the graduate program in Biology. To give students a greater appreciation of the plant world we depend on and provide understanding of physiology of plants under changing environments. Additionally, this course will provide students with training in current plant biotechnology tools.

## **BIOL 5450. Animal Physiology. 4 Hours.**

A study of the fundamental processes of physiological systems in animals from the molecular to the organismal levels of organization.

## **BIOL 5460. Human Physiology. 4 Hours.**

Prerequisites: Admission into the graduate program or permission of instructor. Human physiological principles, from cells to systems, with emphasis on the regulation and integration of organ systems.

## **BIOL 5500. Mycology. 4 Hours.**

Prerequisite: Admission into the graduate program or permission of the instructor. Biology of fungi with emphasis morphology, taxonomy, physiology, and ecology, includes the roles of fungi as both beneficial organisms and as causal agents in plant and animal diseases.

## **BIOL 5530. Biodiversity of Macrofungi. 4 Hours.**

Prerequisites: Acceptance into the graduate program in biology 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. Fields trips may be required.

**BIOL 5550. Phycology. 4 Hours.**

Prerequisite: Admission into the graduate program or permission of the instructor. 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 5600. Local Flora. 4 Hours.**

Prerequisite: Admission into the graduate program or permission of the instructor. 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 5610. Dendrology. 4 Hours.**

Prerequisite: Admission into the graduate program or permission of the instructor. 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 maybe required.

**BIOL 5630. Biology of Horticulture. 4 Hours.**

Prerequisite: Admission into the graduate program or permission of the instructor. Introduction to the biological principles and practices of propagating and growing plants.

**BIOL 5650. Plant Systematics. 4 Hours.**

Prerequisite: Admission into the graduate program in biology or permission of the instructor. A survey of the principles of plant systematics that includes identification, nomenclature, evolution, and classification within the plant kingdom, and a systematic study of plant families with emphasis on local representatives.

**BIOL 5680. Plant Pathology. 4 Hours.**

Prerequisites: Admission into the graduate program 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 5800. Invertebrate Zoology. 4 Hours.**

Prerequisite: Admission into the graduate program or permission of the instructor. A study of the morphology, phylogeny, and ecology of invertebrates.

**BIOL 5810. Introduction to Biogeography. 3 Hours.**

Prerequisites: Three of the following courses, GEOG 1112, GEOG 1113, BIOL 2010, BIOL 2230, BIOL 2270. An overview of factors controlling the distribution of plants and animals on the earth. Topics discussed will include ecological and evolutionary processes, geophysical and climatic phenomenon, and historical and anthropogenic events that have influenced current distributions.

**BIOL 5820. Vertebrate Zoology. 4 Hours.**

Prerequisites: Admission into the graduate program in Biology. An integrated approach to the study of chordates, including classification, evolution, morphology, physiology, ecology, and behavior.

**BIOL 5830. Marine Biology. 3 Hours.**

Prerequisite: Admission to the Graduate Program. An examination of coastal and oceanic organisms and the factors which structure marine systems.

**BIOL 5840. Entomology. 4 Hours.**

Prerequisite: Admission into the graduate program or permission of the instructor. Introduction to the study of insect biology including ecology, behavior, and taxonomy. Laboratory includes field observation, sampling and identification of local fauna.

**BIOL 5850. Medical and Veterinary Entomology. 4 Hours.**

Prerequisite: Admission to the graduate program or permission of 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 5860. Biology of Emerging Infectious Diseases. 3 Hours.**

Prerequisites: Admission into the graduate program or permission of instructor. An overview of emerging human infectious diseases with a special emphasis on biological factors impacting their transmission and control.

**BIOL 5870. Parasitology. 4 Hours.**

Prerequisite: Admission into the graduate program or permission of the instructor. A study of the morphology, life cycles, and host-parasite relationships of representative protozoan and metazoan parasites. Human parasites are emphasized.

**BIOL 5900. Ichthyology. 4 Hours.**

Prerequisite: Admission into the graduate program or permission of the instructor. 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 5920. Herpetology. 4 Hours.**

Prerequisite: Admission into the graduate program or permission of the instructor. Introduction to the study of amphibians and reptiles, including anatomy, physiology, ecology, behavior, and classification coordinated with field study of local species.

**BIOL 5950. Ornithology. 4 Hours.**

Prerequisite: Admission into the graduate program or permission of the instructor. 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 5960. Wildlife Biology. 4 Hours.**

Prerequisites: Admission into the graduate program or permission of the instructor. General principles and techniques in wildlife conservation, ecology, and management, with an emphasis on life histories and taxonomy of game species of the southeastern United States.

**BIOL 5970. Wildlife Diseases. 3 Hours.**

Prerequisites: Admission into the graduate program or permission of the instructor. 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 5980. Mammalogy. 4 Hours.**

Prerequisite: Admission into the graduate program or permission of the instructor. 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 6000. Topics in Biology I. 3 Hours.**

Prerequisite: Admission into the graduate program or permission of the instructor. Selected topics in the biological sciences. May be repeated if the topic is different. This course does not include a laboratory.

**BIOL 6010. Topics in Biology II. 4 Hours.**

Prerequisite: Admission into the graduate program or permission of the instructor. Selected topics in the biological sciences. May be repeated if the topic is different. This course includes a laboratory.

**BIOL 6020. Topics in Conservation Biology. 2-4 Hours.**

Prerequisites: Admission into the graduate program or permission of the Instructor. 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 6100. Morphology of Land Plants. 4 Hours.**

Prerequisite: Admission into the graduate program or permission of the instructor. Study of vegetative organization and reproductive cycles of bryophytes, pteridophytes and seed plants, which incorporates phylogenetic and ecological relationships.

**BIOL 6200. Plant Anatomy. 4 Hours.**

Prerequisite: Admission into the graduate program or permission of the instructor. 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 6250. Human Anatomy. 4 Hours.**

Prerequisites: Admission into the graduate program 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 6300. Comparative Vertebrate Anatomy. 4 Hours.**

Prerequisite: Admission into the graduate program or permission of the instructor. Anatomical and phylogenetic survey of representative vertebrate animals.

**BIOL 6350. Developmental Biology. 4 Hours.**

Prerequisite: Admission into the graduate program or permission of the instructor. A study of the development from fertilization through embryological stages with an emphasis placed on experimental embryology and molecular genetic mechanisms in selected model organisms.

**BIOL 6400. Vertebrate Histology. 4 Hours.**

Prerequisite: Admission into the graduate program or permission of the instructor. 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 6450. Theory and Practice of Scanning Electron Microscopy. 4 Hours.**

Prerequisites: Admission into the graduate-program 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 6500. Cell Biology. 4 Hours.**

Prerequisite: Admission into the graduate program or permission of the instructor. The organization and function cellular structures in animal, plant, and microbial systems. Emphasis on the molecular basis of metabolism, transport, mobility, nerve conduction, and the cell cycle.

**BIOL 6510. Virology. 3 Hours.**

Prerequisites: Admission into the graduate program or permission of the instructor. An introduction to viruses and other noncellular infectious agents. Topics include the structure and composition of these agents, their replication, effects on their hosts, and host responses. Methods for studying these agents, their origin and evolution, and their uses in biotechnology will also be discussed.

**BIOL 6520. Molecular Biophysics. 3 Hours.**

Prerequisite: Admission into the graduate program or permission of the instructor. Introduction to thermodynamics, kinetics and their applications to biological systems. Students are expected to enhance their understanding of current biological literature that contains biophysical concepts covered in this course.

**BIOL 6530. Comparative Biomechanics. 4 Hours.**

Prerequisites: Acceptance into the graduate program or permission of the instructor. An application of physics and engineering principles for the biologist. Mechanics is used to investigate how aquatic, terrestrial, and aerial organisms function. Sample topics include integrated lectures and labs explore the limitations and opportunities the physical world provides to organisms. Sample topics include fly and bird flight, bone breakage, tendon/muscle functions, and biomimetic design.

**BIOL 6540. Bioinformatics. 3 Hours.**

Prerequisite: Admission into the graduate program or permission of the instructor. A study of the theoretical principles underlying bioinformatics analysis and a hands-on analysis using publicly available databases and software. Additional topics such as epigenetics or systems biology may be included.

**BIOL 6550. Immunology. 4 Hours.**

Prerequisite: Admission into the graduate program or permission of the instructor. 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 6560. Quantum Biology. 3 Hours.**

Prerequisite: Admission to the graduate program or permission of the instructor. A study of the role of quantum mechanics in biological and biochemical phenomena. Basic concepts in quantum aspects of nature will be reviewed and their implications in biology will be examined.

**BIOL 6580. Molecular Genetics. 4 Hours.**

Prerequisite: Admission into the graduate program or permission of the instructor. A study of current principles of DNA structure and function. Laboratory emphasis will focus on modern techniques in DNA isolation, modification, and electrophoretic characterization.

**BIOL 6600. Evolution. 3 Hours.**

Prerequisite: Admission into the graduate program or permission of the instructor. Study of the theoretical aspects and the patterns and processes of micro-and-macro evolutionary change.

**BIOL 6650. Animal Behavior. 4 Hours.**

Prerequisite: Admission into the graduate program or permission of the instructor. Introduction to the major concepts of causation, development, evolution, and ecology of animal behavior, emphasizing the behavior of social animals.

**BIOL 6700. Limnology. 4 Hours.**

Prerequisite: Admission into the graduate program or permission of the instructor. A study of the physical, chemical, and biological aspects of fresh waters.

**BIOL 6710. Aquatic Toxicology. 4 Hours.**

Prerequisites: Admission to the graduate program or permission of the instructor. 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, with following EPA protocols. Statistical methods will be used to analyze collected data, and the results will be interpreted.

**BIOL 6720. Stream Ecology. 4 Hours.**

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 6730. Climate Change Biology. 3 Hours.**

Prerequisites: Admission into the graduate program or permission of the instructor. An overview of climate mechanisms and the responses of past and present biological organisms to climate change.

**BIOL 6750. Population Biology. 3 Hours.**

Prerequisites: Admission into the graduate program or permission of the instructor. A review of the theory and applications of population biology, including single-species population growth models (exponential, geometric, logistic, life tables, stage 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 6800. Protein Biochemistry. 4 Hours.**

Prerequisites: Admission into the graduate program or permission of the instructor. 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 6850. Biology Graduate Internship. 3 Hours.**

Prerequisite: Acceptance into the graduate program in biology. Provision of practical experience in the field of biological sciences. A written report is required. Approval forms must be completed with the internship supervisor prior to course registration. Graded "Satisfactory" or "Unsatisfactory." May be repeated once for credit.

**BIOL 6950. Directed Study. 4 Hours.**

Prerequisite: completion on all required upper-division biology courses with distinctly superior academic records and the consent of the instructor. Limited to selected students with approval of instructor and Department Head. A specific problem to include supervised investigation and a report in format of biological journals.

**BIOL 7000. Introduction to Research. 2 Hours.**

Prerequisite: Acceptance into the graduate program in biology. An introduction to the scientific method, primary research literature, methods of literature review and scientific writing. A research prospectus is required by the end of the semester. This course is to be taken during the student's first semester in the graduate program.

**BIOL 7010. Special Topics in Ecology and Evolution. 2 Hours.**

Prerequisite: Acceptance into the graduate program in biology or permission of the instructor. In-depth analysis of a current issue in ecology and evolution requiring student presentations and extensive background reading. The specific topic within ecology and evolution will change each time the course is offered. Course may be taken one additional time for credit, with permission of the instructor.

**BIOL 7020. Special Topics in Cell and Molecular Biology. 2 Hours.**

Prerequisite: Acceptance into the graduate program in biology or permission of the instructor. Advanced study of cellular and molecular biology requiring reading of the current literature and student presentations. Topics will change each time the course is offered. Course may be taken twice for credit with permission of the instructor.

**BIOL 7030. Special Topics in Physiology. 2 Hours.**

Prerequisite: Acceptance into the graduate program in biology or permission of the instructor. Advanced study of physiology at the organism, tissue, cell and molecular levels requiring reading of the current literature and student presentations. Topics will change each time the course is offered. Course may be taken twice for credit with permission of the instructor.

**BIOL 7050. Experimental Design and Data Analysis in the Biological Sciences. 3 Hours.**

Prerequisites: MATH 2620 or comparable course, and admission into the graduate program or permission of the instructor. Application of statistical methods to the study of biological problems, with an emphasis on the interaction between the choice of statistical methods and experimental design.

**BIOL 7440. Fundamentals of Evolution. 3 Hours.**

Fundamentals of Evolution. Prerequisite: BIOL 2108K with grade of C or higher. Three lecture hours a week. Mechanisms of evolution, from the molecular to the population level. Topics include population genetics, adaptation, natural selection, speciation, systematics, coevolution, history of life, the geological record, and evolution of humans. This course is also recommended for middle and high school biology teachers.

**BIOL 7900. Graduate Seminar. 2 Hours.**

Prerequisites: Acceptance into the graduate program in biology. Discussion and critical analysis of peer-reviewed literature in biology and related sciences. Students must take this course once for credit. This course may be repeated for a maximum of three times for credit.

**BIOL 8999. Thesis. 1-6 Hours.**

Prerequisites: Completion of BIOL 7000 and permission of the student's major thesis advisor. Students are required to enroll in thesis hours when doing original research towards the thesis. Students must complete a minimum of 6 hours of BIOL 8999 prior to defense of the thesis. BIOL 8999 may be repeated for credit.