

## **BIOLOGY COURSE DESCRIPTIONS**

### **BIOL 117: ENVIRONMENTAL SCIENCE (4)**

This lecture/laboratory course explores how organisms, communities, and ecosystems function under natural conditions as well as how they function under human influence. Discussions and hands-on laboratory work cover a variety of current topics, including dynamics of population growth, patterns of extinction, global warming, acid rain, water pollution, solid waste management, sustainable agriculture, and renewable energy. Not intended for students majoring in biology. Open to first-year students. Also listed as ES 117. No prerequisite.

### **BIOL 121: PLANTS AND PEOPLE - AN INTRODUCTION TO ETHNOBOTANY (4)**

This interdisciplinary course draws from the natural and social sciences to investigate plant-human interactions. We'll examine modern and historical uses of plants in a variety of cultures. Topics explored include plants as food, medicine, and in ritual and everyday life. The combined lecture/laboratory format allows students to experience the science of ethnobotany firsthand through experimentation and observation. At least one weekend field trip will be required. Not intended for students majoring in biology. Also listed as INTL 121. No prerequisite.

### **BIOL 130: BIOLOGICAL SELF DEFENSE (4)**

This lecture/laboratory course will explore how the human immune system protects us from disease and the microbial pathogens that try to breach our defenses. The outcome of this constant interaction dictates the state of human health. Topics covered will include sexually transmitted diseases, biological agents, AIDs, malaria, and other diseases of public health interest. Laboratory experiments will investigate different facets of the immune system, the ubiquity of microorganisms and antibiotic sensitivity/resistance. Not intended for students majoring in biology. No prerequisite. Open to first-year students.

### **BIOL 132: HUMAN BIOLOGY - HOW DOES MY BODY WORK? (4)**

This lecture/laboratory course explores the basic principles and functions of the human body (such as digesting a meal, taking a breath, or fighting an infection) and puts them in the context of total body function. The aims of this course are to provide students with hands-on experience gathering physiological data, as well as with a basic knowledge of human health, which will provide them with a foundation from which they can ask informed questions of a physician about their own health and/or the health of their family members. Not intended for students majoring in biology. Open to first-year students. No prerequisite.

### **BIOL 140: HUMAN GENETICS (4)**

In this combined lecture/laboratory course we explore the science behind such issues as human cloning, genetic testing, gene therapy, forensic DNA evidence, and genetically modified foods. Students gain an understanding of how the Human Genome Project may impact their lives and get a hands-on introduction to the laboratory analyses used in these studies. Not intended for students majoring in biology. Open to first-year students. No prerequisite.

### **BIOL 150: SPECIAL TOPIC - PLANTS OF VIRGINIA (2)**

The Appalachian-Blue Ridge Forest ecoregion represents one of the world's richest temperate broadleaf forests in floral diversity. This field oriented course will explore the diversity of plants in the region to study basic plant identification and collection techniques, plant anatomy and ecology, and to learn the ethnobotanical uses of local plants (e.g. food, medicine, shelter, etc.) by the Native Americans and others. At least one weekend field trip will be required. This course is designed for both science and nonscience students.

### **BIOL 156: THE BIOLOGY OF WOMEN AND ITS SOCIAL IMPLICATIONS (4)**

Consideration of the biological changes that occur in a woman's life and their psychological effects. Topics discussed include cycles of reproduction, birth control, abortion, aging, mental health, and diseases of women.

The use of male models in medical, biological, and psychological research and the relationship between women, and the health care system are examined. This course does not count toward the biology major. Also listed as GWS 156. Open to first-year students. No prerequisite.

**BIOL 197F: FIRST-YEAR SEMINAR – THINKING LIKE A MOUNTAIN: DISCOVERY, EXPLORATION, AND CONSERVATION OF OUR NATURAL WORLD (4)**

The goal of this course is to develop or reestablish the connections our students have with the natural world. We will spend extensive time outside observing organisms in terrestrial and aquatic habitats, navigating and orienteering, and exploring natural environments through journaling and individual and group-oriented exercises. From these experiences, students will ultimately develop a personal environmental ethic. Also listed as ES 197F. Placement to be determined during the summer.

**BIOL 197F: FIRST-YEAR SEMINAR - YOU ARE WHAT YOU EAT: MAKING GOOD FOOD CHOICES FOR YOUR HEALTH AND THE ENVIRONMENT (4)**

Why do we make the food choices we make? Do we choose food mainly out of habit, or do we consider what is in it and how it was grown? How does the media and advertising influence our diet? In this course students learn to critically evaluate the foods they eat and the messages the food choices send to their bodies and the environment. We will examine where our foods come from, how food production and transportation impact the environment, why excessive use of pesticides has become problematic, and why *trans* fats and genetically modified foods (GMOs) may pose health risks. We will also investigate the energy footprints of processed foods and whole foods, and learn why some scholars advocate locally produced food and plant-based diets as the solution to the many environmental and health issues that surround food. Laboratory investigations will include testing for GMOs in foods, producing cultured and fermented foods, and analyzing our diets for nutritional content. Also listed as ES 197F. No prerequisite. Placement to be determined during the summer.

**BIOL 207: ECOLOGY (4)**

As one of the core courses for the biology major, we will explore the structure and function of the natural world. This course examines the relationships between organisms and their physical and biological environment, global patterns of climate and biological life, patterns in population dynamics, as well as structure and change in communities of organisms. Open to first-year students. Also listed as ES 207. No prerequisite.

**BIOL 207L: LABORATORY FOR ECOLOGY (2)**

Students will have ample opportunity to explore the local environment on field excursions. Students will also have several opportunities to carry out their own independent research. Also listed as ES 207L. Corequisite: BIOL 207. Prerequisite: q.

**BIOL 220: HUMAN PHYSIOLOGY (4)**

As one of the four core courses for the biology major, this course introduces basic physiological processes that maintain homeostatic balance in humans. Open to first-year students. Prerequisite: CHEM 101 or CHEM 105 as a prerequisite or corequisite, or permission.

**BIOL 220L: LABORATORY FOR HUMAN PHYSIOLOGY (2)**

This laboratory provides experience in using equipment and techniques for measuring physiological parameters. Corequisite: BIOL 220.

**BIOL 228: INTRODUCTION TO NEUROSCIENCE (4)**

This is a beginning-level neuroscience course that serves as a prerequisite for advanced courses in neuroscience. The course covers the fundamentals of the structure and function of the nervous system on both a small and large scale. Sensory systems are covered in detail. Also listed as PSY 228. Prerequisite: BIOL 220 or PSY 141.

**BIOL 228L: LABORATORY FOR INTRODUCTION TO NEUROSCIENCE (2)**

This laboratory gives students hands-on experience with visualizing nerve cells, immunohistochemistry, generating action potentials, brain anatomy, sensory reception and processing, and control of movement. Also listed as PSY 228L. Corequisite: BIOL 228.

**BIOL 236: MOLECULAR AND CELL BIOLOGY (4)**

The diversity and complexity of different cell types found in multicellular organisms is extensive, yet all eukaryotic cells have the same basic molecular components. One of the four core courses for the biology major, this course provides an overview of cell structure, biological macromolecules, cellular reproduction, and gene structure and function. Open to first-year students. Prerequisite: CHEM 101 or CHEM 105. Corequisite: BIOL 220 or permission.

**BIOL 236L: LABORATORY FOR MOLECULAR AND CELL BIOLOGY (2)**

This project-oriented laboratory provides students with the opportunity to analyze and characterize DNA and other cellular molecules. The course is designed to give students experience with an array of molecular biological techniques. In addition, students are exposed to elements of research and experimental design in a directed framework. Corequisite: BIOL 236.

**BIOL 241: PLANT BIOLOGY (4)**

This course provides a comprehensive understanding of the nature of plants and the practice of plant science. We'll cover the structure, function, and diversity of plants, including discussions of practical/applied plant biology (conservation, biotechnology, etc.). You will be challenged to build an integrated understanding of plants, from an awareness of their biochemistry to their roles in an ecosystem, enabling future studies of plants and plant-mediated processes. No prerequisite

**BIOL 241L: LABORATORY FOR PLANT BIOLOGY (2)**

Laboratory sessions provide a hands-on introduction to plant biology in laboratory and field settings. Investigations of plant structure, diversity, ecology, and physiology will introduce students to experimental design, data collection, and subsequent written and oral presentations of results. At least one weekend field trip will be required. Corequisite: BIOL 241.

**BIOL 250: SPECIAL TOPIC - APPALACHIA: ENVIRONMENTAL PROBLEMS AND SOLUTIONS (2)**

In this two-credit seminar course, we delve into the natural and cultural history of the Appalachians, as well as explore current and historical environmental problems. These issues include deforestation, water contamination, species extinction and restoration, sustainable development, and forestry. While most of our explorations take place between the covers of the books we read and in class discussions, we also have the chance for hands-on explorations of at least one small patch of Appalachian habitat. By the end of the course, students should have a better understanding of and connection to the life in the hills that surround our Hollins home.

**BIOL 250: SPECIAL TOPIC - BIRDS OF VIRGINIA (4)**

Through study in both the laboratory and the field, students develop skills enabling them to identify, by both sight and sound, birds common in the state of Virginia. In addition, students explore the fascinating behaviors associated with avian reproduction and migration. One or more weekend field trips provide opportunities to observe birds in different habitats within the state.

**BIOL 250: SPECIAL TOPIC - CONNECTIONS TO NATURE (4)**

Nature is understood from a variety of perspectives: from the total immersion in nature typical of indigenous peoples, to the philosophical musings of writers, to the field experiments of natural scientists. This seminar course explores the natural history of our local environment, the Appalachians, from these various perspectives

through nonfiction and fiction works as well as scientific papers. Over the course of the semester, students also study and come to understand their own patch of Appalachian forest. A weekend field/camping trip is also required.

#### **BIOL 250: SPECIAL TOPIC - FIELD VERTEBRATE ZOOLOGY (4)**

In this combined lecture/laboratory course, we will explore topics that are of concern to field biologists—including evolution, ecology, physiology, behavior, and conservation—using vertebrates as our focus organisms. Beyond the designated class times, students will be expected to participate in a weekend field trip to the NC coast in February to experience one of the more amazing vertebrate spectacles—the migration and overwintering of waterfowl of North America. In addition, students will be expected to participate in 2-4 other day (weekend) or evening excursions to search for breeding amphibians and other interesting vertebrates. By the end of this course, students should have a much deeper understanding of vertebrate diversity, biology, and conservation issues as well as a more developed sense for techniques necessary to study vertebrates in natural conditions. The cost of rooms and meals for weekend trips will be shared by participants. Also listed as ES 250. No prerequisite.

#### **BIOL 250: SPECIAL TOPIC - ORNITHOLOGY (4)**

With nearly 10,000 recognized species, the Class Aves is one of the most diverse groups of animals on Earth. In this combined lecture/laboratory course, students explore the anatomy, physiology, behavior, taxonomy, evolution, and life history of birds, as well as the history of the study of these organisms. During weekly trips into the field, students will explore a variety of habitats and observe birds in their natural environments at several key points of their annual cycle (over-wintering, spring migration, and breeding). During these field experiences, students will learn to identify avian species by both sight and sound. Open to first-year students. No prerequisite.

#### **BIOL 250: SPECIAL TOPIC - PLANTS, PEOPLE, AND THE LAND THROUGH TIME (2)**

All landscapes have a history of past human impacts, some obvious, others subtle. The legacies of historic relationships may still be seen in the plants and people that inhabit the modern ecosystems. This course is intended to explore the relationship between people and the landscapes that sustain them. To understand the lingering consequences of human history on current ecosystems and landscapes, and conversely to understand the role that changing environments have played in human history requires an interdisciplinary approach. Different disciplines working together can develop information that none alone can provide, and integration of these disciplines can assist us in dealing responsibly with our role in the biosphere. To investigate these ideas we read works by environmental historians, historical ecologists, and Native American authors.

#### **BIOL 250: SPECIAL TOPIC – SPINNING YOUR FOOD WEB (2)**

This course explores how food production, processing, transportation, and consumption affect the environment and society. Our discussions will focus on the interrelatedness of food, environmental, and social systems in order to further our understanding of one's personal impact on local, national, and global food issues. Case studies will be used to examine these complex relationships, and we will consider alternative approaches to achieving both local and global food security and the important role public health can play. This course will challenge your ability to understand food and environment issues from diverse perspectives, as well as better understand and appreciate your own culture and experiences and the influence of these experiences on your worldview. Specific topics will range from the Slow Food Movement to industrial farming, and we will read several books and share at least one meal as a class. Also listed as ES 250. No prerequisite.

#### **BIOLOGY 260: HUMAN ANATOMY (4)**

In this course, students have the opportunity to investigate the structure of the human body through independent exploration of texts and computer-based models of human anatomy. Students will be evaluated for their understanding of each anatomical system through written tests, lab practicals, and oral exams. This

self-directed course is only for students who need human anatomy as a prerequisite for professional schools. Permission of the instructors is required. Prerequisite/corequisite: BIOL 220 and BIOL 220L.

**BIOL 290: INDEPENDENT STUDY (2 or 4)**

Tutorials based on standard primary and secondary sources or may contain an experiential component. These studies, below the advanced level, must be planned and approved in consultation with a member of the department prior to registration. Maximum of 8 credits permissible.

**BIOL 301: HISTOLOGY (4)**

Study of microscopic anatomy of mammalian tissues, including integration of structure and function. Prerequisite: BIOL 220 or BIOL 315 or permission.

**BIOL 301L: LABORATORY FOR HISTOLOGY (2)**

Emphasis on histological technique. Introduction to the techniques involved in making histological slides and the study of prepared slides. Corequisite: BIOL 301.

**BIOL 310: EVOLUTION AND THE HUMAN CONDITION (4)**

Seminar relating basic evolutionary concepts, such as natural selection, sexual selection, kin selection, and population genetics to human health and disease and to the impact of human activity in the world. We will explore a variety of issues from the costs and benefits of aging, to the host-pathogen arms race, to the long-term viability of conservation programs for endangered species. Prerequisite: one of the four biology core courses (BIOL 207, BIOL 220, BIOL 236, or BIOL 241) or permission of instructor.

**BIOL 312: MICROBIOLOGY (4)**

The term microorganism brings to mind the thought of disease and infection, yet plants and animals cannot exist without the many microbes in our world. This course provides a survey of microorganisms, focusing largely on the bacterial organisms and viruses that have the greatest impact on our existence. Prerequisites: BIOL 220 and BIOL 236; CHEM 102 or CHEM 105.

**BIOL 312L: LABORATORY FOR MICROBIOLOGY (2)**

This lab concentrates on techniques for culturing, handling, and identifying microorganisms. Students also carry out independent laboratory projects during the final weeks of the semester. Corequisite: BIOL 312.

**BIOL 313: INVERTEBRATE ZOOLOGY (4)**

Invertebrates, members of the animal kingdom lacking a backbone, comprise 95 percent of the animals on Earth today. In this course, we explore the anatomy, physiology, behavior, ecology, and taxonomy of this incredibly diverse group of animals. Prerequisite: BIOL 220.

**BIOL 313L: LABORATORY FOR INVERTEBRATE ZOOLOGY (2)**

This laboratory provides students the opportunity to explore the anatomy of invertebrate organisms, the environments in which they live, and the techniques used to classify them. Exercises are conducted in both the laboratory and the field. Corequisite: BIOL 313.

**BIOL 314: GENETICS (4)**

This course covers aspects of inheritance, including classical Mendelian and modern molecular genetics. Population genetics and variation will also be explored. Prerequisite: One of the four biology core courses (BIOL 207, BIOL 220, BIOL 236, or BIOL 241) or permission of instructor.

**BIOL 314L: LABORATORY FOR GENETICS (2)**

In this laboratory students gain practical experience in the techniques of both classical geneticists and molecular biologists. In the first part of the semester, students perform crosses of mutant strains of the fruit fly, and in the second part of the semester, students use recombinant DNA techniques to gain an appreciation for the molecular nature of genes. Corequisite: BIOL 314.

**BIOL 315: COMPARATIVE VERTEBRATE ANATOMY (4)**

Why are there no flying elephants? In this course we will compare the design and structure of vertebrate animals in relationship to the environments in which they evolve. We will emphasize the functional morphology of anatomical systems and major adaptive changes in the evolution of vertebrate structure. Prerequisite: BIOL 220.

**BIOL 315L: LABORATORY FOR COMPARATIVE VERTEBRATE ANATOMY (2)**

This laboratory involves detailed dissections and comparisons of organ systems in the lamprey, shark, and cat. Corequisite: BIOL 315.

**BIO 317: BIOLOGICAL PSYCHOLOGY (4)**

Also listed and described as PSY 317. Prerequisites: PSY 141 (or permission) and BIOL 220.

**BIOL 321: ETHNOBOTANICAL TECHNIQUES (4)**

Ethnobotany has expanded from simply being the use of plants by traditional peoples, to examining the relationship between societies and plants. The course examines the modern practice of ethnobotany through recent scientific literature. Students will read a variety of articles and present their readings during class. Prerequisite: BIOL 241 and CHEM 204 or permission of instructor.

**BIOL 322: DEVELOPMENTAL BIOLOGY (4)**

Development from the fertilized egg to a complete adult organism requires a precisely coordinated series of events involving molecular, cellular, and organismal mechanisms. This course provides an integrative survey of animal development, with a focus on those unifying mechanisms that are common to all developing embryos. Prerequisite: BIOL 236.

**BIOL 322L: LABORATORY FOR DEVELOPMENTAL BIOLOGY (2)**

This laboratory is designed to give the student hands-on experience in experimental embryology. The first part of the course is devoted to techniques for handling, culturing, and manipulating invertebrate and vertebrate embryos. Students then apply these techniques in self-designed independent projects during the remaining half of the semester. Corequisite: BIOL 322.

**BIOL 323: ANIMAL BEHAVIOR (4)**

Analyses of animal behavior incorporating ethological, ecological, and evolutionary perspectives. This interdisciplinary course covers the development, underlying mechanisms, adaptive value, and evolution of behavior. Also listed as PSY 323. Prerequisites: BIOL 207 or BIOL 220.

**BIOL 323L: LABORATORY FOR ANIMAL BEHAVIOR (2)**

Observational and experimental techniques in field and laboratory settings. The lab culminates in independent research projects. Corequisite: BIOL 323.

**BIOL 332: IMMUNOLOGY (4)**

This course provides an overview of the cell and molecular biology of the mammalian immune response, focusing on antibody structure and function, cells and tissues of the immune system, and the genetic basis for antibody diversity. Advances in studies of immune deficiencies, autoimmune diseases, the allergic response,

transplant rejection, and cancer are also covered. Prerequisites: BIOL 220 and BIOL 236 and CHEM 101 or CHEM 105.

#### **BIOL 332L: LABORATORY FOR IMMUNOLOGY (2)**

This laboratory provides students with hands-on experience in experimental techniques used in immunology research. Laboratory methods focus on cellular, molecular, and biochemical aspects of immunology. Corequisite: BIOL 332.

#### **BIOL 337: ORNITHOLOGY (4)**

With nearly 10,000 recognized species, the taxonomic class Aves is one of the most diverse groups of animals on earth. In this lecture course students will explore the anatomy, physiology, behavior, taxonomy, evolution, and life history of birds. Prerequisite: BIOL/ES 207 or permission from instructor. Also listed as ES 337. Prerequisite: BIOL/ES 207 or permission.

#### **BIOL 337L: LABORATORY FOR ORNITHOLOGY (2)**

Students in this field laboratory course will explore the life history of birds, observe them in their natural environments, and learn to identify them by sight and sound. Students will be expected to participate in a weekend field trip (to either the North Carolina coast or Eastern Shore of Virginia) and in several other morning/evening activities. The cost of rooms and meals for the weekend trip will be shared by participants (\$150 required). Corequisite: BIOL 337. Also listed as ES 337. Prerequisite: BIOL/ES 207 or permission.

#### **BIOL 350: SPECIAL TOPIC – ADVANCED MOLECULAR GENETICS (4)**

How genes are linked with particular biological functions has been a central question for biologists since the discovery of DNA. This literature-focused course will explore approaches for discovering the genes that control particular functions (forward genetics), determining the functions of a particular gene (reverse genetics), and modern genome-wide studies. Prerequisites: BIOL 220 and BIOL 236; BIOL 314 recommended.

#### **BIOL 350L: SPECIAL TOPIC – LABORATORY FOR ADVANCED MOLECULAR GENETICS (2)**

In this laboratory, students will gain hands-on experience with forward and reverse molecular genetics techniques. These techniques will be practiced as students undertake an exploration of the genes and pathways that control development in the roundworm *Caenorhabditis elegans* as well as other species. Corequisite: BIOL 350.

#### **BIOL 350: SPECIAL TOPIC - BIOGEOCHEMISTRY (4)**

This course examines the control and function of the Earth's global biogeochemical cycles, drawing from the biological, geological, and chemical sciences. We also explicitly address anthropogenic perturbations to biogeochemical cycles and consider future global changes. Topics addressed include origins of the solar system and of life, global and regional carbon cycles, nutrient cycling in terrestrial and aquatic environments, trace gas fluxes, and bioactive metals. Attention is also given to the tools employed by biogeochemists such as the use of isotopic tracers, various analytical equipment, and mathematical models. Interactions between global biogeochemical cycles and other components of the Earth system are discussed. Prerequisites: CHEM 101 or CHEM 105 and either BIOL 117, BIOL 207, BIOL 241, or permission of the instructor.

#### **BIOL 350: SPECIAL TOPIC - THE ECOPHYSIOLOGY OF PLANTS**

This course examines the ecological and physiological factors affecting the structure of plant communities, and the distribution, abundance, and population dynamics of individual species. The influence of the environment, disturbance history, competition, and herbivory on the organization of plant communities and their physiological abilities are considered. Throughout the course an attempt is made to blend empirical patterns, experimental results, and theory. Prerequisites: BIOL 207 and BIOL 241, or permission of instructor.

**BIOL 350: SPECIAL TOPIC – FIELD VERTEBRATE ZOOLOGY (4)**

In this lecture/laboratory course, we will explore evolution, ecology, physiology, behavior, and conservation—using vertebrates as our focus organisms. Students are expected to participate in a weekend field trip to the NC coast (avian biodiversity) as well as to participate in several evening excursions to search for breeding amphibians. Students will develop a much deeper understanding of vertebrate diversity, biology, and conservation issues as well as an understanding of techniques necessary to study vertebrates in natural conditions. Course fee of \$125 required for weekend field trip. Also listed as ES 350. Prerequisite BIOL/ES 207 and BIOL/ES 207L.

**BIOL 350: SPECIAL TOPIC - MOLECULAR EVOLUTION (4)**

This seminar course will introduce to the student the study of evolution at the level of DNA and proteins. We will first look at the various types of DNA mutation that can lead to structural and functional changes in an organism. Further topics will include examining the various types of evolutionary constraints on organismal development and structure, evolutionary limitations to protein function, and changes to genes and chromosomes via duplication and rearrangement. Prerequisite: BIOL 310 or BIOL 314, or permission.

**BIOL 350: SPECIAL TOPIC - MOLECULAR PATHOGENESIS (4)**

The molecular mechanisms of disease processes, including those caused by microbial pathogens (e.g., bacteria, viruses, and parasites) and physiological dysfunction (e.g., inflammation, malignancy, and tissue breakdown), have been the subject of biological inquiry for several decades. This literature-focused and discussion-based courses will explore the molecular mechanisms by which pathogens and organismal processes cause disease from both the pathogen and host perspectives. Prerequisite: BIOL 236 or permission.

**BIOL 350: SPECIAL TOPIC – ORNITHOLOGY (4)**

Students in this course will explore the life history of birds, observe them in their natural environments, and learn to identify them by sight and sound. Students will be expected to participate in a weekend field trip to the North Carolina coast and in several other morning/evening activities. The cost of rooms and meals for the weekend trip will be shared by participants (\$120-150 required). Also listed as ES 350. Prerequisite: BIOL/ES 207 or permission from instructor.

**BIOL 351: BIOCHEMISTRY (4)**

Also listed and described as CHEM 351. Prerequisites: CHEM 222 and CHEM 222L or equivalent.

**BIOL 351L: LABORATORY FOR BIOCHEMISTRY (2)**

Also listed and described as CHEM 351L. Corequisite: BIOL 351.

**BIOL 352. ADVANCED BIOCHEMISTRY (4)**

Also listed and described as CHEM 352. Prerequisite: BIOL 351.

**BIOL 352L: LABORATORY FOR ADVANCED BIOCHEMISTRY (2)**

Also listed and described as CHEM 352L. Corequisite: BIOL 352.

**BIOL 354: NEUROBIOLOGY (4)**

This neuroscience course examines the neuron and its biological interactions in vertebrate and invertebrate nervous systems. Topics include neuroanatomy, development, chemistry, physiology, and pathology of the nervous system. Prerequisite: BIOL 220.

**BIOL 354L: LABORATORY FOR NEUROBIOLOGY (2)**

The labs in the first weeks of the semester are devoted to learning some neurobiology techniques such as neuron backfilling and immunohistochemistry. Then students design and conduct their own research project. Corequisite: BIOL 354.

**BIOL 357: CONSERVATION BIOLOGY (4)**

This seminar examines the impact of current environmental problems (global warming, introduced species, degradation of water resources, land use practices, etc.) on the life-sustaining properties of natural ecosystems, as well as current theories and practices in conservation biology. We not only try to understand the nature, cause, and implications of various environmental issues, but we also explore possible solutions to the problems. Each student has the opportunity to explore a particular environmental problem of interest (from local to global) and present her research. Also listed as ES 357. Prerequisites: BIOL 207 and 207L or BIOL 117 and permission of instructor.

**BIOL 357L: LABORATORY FOR CONSERVATION BIOLOGY (2)**

Laboratory activities will cultivate an understanding of real-world, hands-on conservation biology through fieldtrips, active discussions, and training on the use of professional tools used by conservation biologists, such as GIS (Geographic Information Systems), which significantly aid in the decision-making process for the management and preservation of biodiversity. Also listed as ES 357L. Corequisite: BIOL 357.

**BIOL 361: PHYSIOLOGICAL ECOLOGY (4)**

Living organisms must overcome the challenges imposed by their natural surroundings to survive. This course explores the physiological mechanisms that animals (both vertebrate and invertebrate) employ to flourish in a variety of environments, both aquatic and terrestrial. Using a comparative approach in the context of evolution, students explore topics such as osmoregulation and excretion, metabolism, respiration and circulation, thermoregulation, and the neuroendocrine control of physiology and behavior. Prerequisites: BIOL 220 or BIOL 207.

**BIOL 361L: PHYSIOLOGICAL ECOLOGY LAB (2)**

This laboratory provides students with hands-on experience documenting and experimentally manipulating the physiological mechanisms employed by organisms in response to a variety of environmental conditions. Following introductory laboratory experiences, students design and carry out their own experiments to test questions involving a variety of physiological processes. Corequisite: BIOL 361.

**BIOL 390: INDEPENDENT STUDY (2 or 4)**

Independent study conducted at the advanced level. Application must be made with faculty prior to registration.

**BIOL 391: INDEPENDENT RESEARCH IN BIOLOGY (4)**

This course is intended for students conducting independent scientific research. At the beginning of the semester in which the student enrolls in this course, a proposal for the research project will be developed in consultation with the faculty supervisor. The project must involve laboratory and/or field research with significant data collection and analysis. The student will be expected to produce a formal scientific report at the conclusion of the project, which should include a review of the scientific literature relevant to the study. Prerequisites: two of the four biology core courses (BIOL 207, BIOL 220, BIOL 236, or BIOL 241).

**BIOL 399: INTERNSHIP (4)**

Application must be made with faculty prior to registration. May be proposed any term.

**BIOL 471, 472: SENIOR SEMINAR (2, 2)**

All senior majors participate in this seminar course. Each senior will present an article from the primary literature and present the research findings to the class. If a senior is carrying out research, she may present her project and findings to the class.

**BIOL 480: SENIOR THESIS (4, 4)**

Students are expected to carry out a yearlong research project (includes Short Term). The research project will be summarized in a paper of publication quality. If a student's status and thesis meet the requirements for honors, then BIOL 480 will be converted to BIOL 490. Application must be made with faculty prior to registration.

**BIOL 490: SENIOR HONORS THESIS (4, 4)**

Students should not register for BIOL 490. Research is initially conducted as BIOL 480: Senior Thesis. Honors status will be determined in the spring.