BIOLOGICAL SCIENCES (BIO)

BIO 1. Biodiversity, Evolution and Ecology. 5 Units
General Education Area/Graduation Requirement: Life Forms (B2), Laboratory (B3)
Term Typically Offered: Fall, Spring, Summer

Introduction to properties of life and cells leading to genetic and biological diversity. Survey of biological diversity emphasizing variation leading to natural selection; introduction to ecological concepts within an evolutionary framework; a survey of ecosystems and global climate change. Development of scientific skills will be emphasized. Designed for science majors. Lecture three hours; laboratory three hours; activity two hours; fee course.
Note: Field trips may be required.

Fee course.
Field trip(s) may be required.

BIO 2. Cells, Molecules and Genes. 5 Units
Prerequisite(s): BIO 1 and CHEM 1A.
Term Typically Offered: Fall, Spring

Introduction to molecular and cellular biology and genetics. Topics include biomolecules, cell structure and function, cellular energetics, molecular flow of information, cell division, and genetic inheritance. Development of scientific skills and a scientific mindset will be emphasized throughout the course, particularly in lab exercises and activities. Designed for science majors. Lecture three hours; laboratory three hours; activity two hours.

BIO 7. Introduction to the Science of Biology. 4 Units
General Education Area/Graduation Requirement: Laboratory (B3), Life Forms (B2)
Term Typically Offered: Fall, Spring

Introduction to major concepts of biology, including properties of living things, cells and their molecular constituents, the unity and diversity of organisms, genetics, ecology, evolution, and the scientific methods of investigation employed by biologists. Satisfies requirements in biology for students planning to obtain the Multiple Subject Teaching Credential. Lecture three hours; laboratory three hours. Fee course.
Fee course.

BIO 9. Our Living World: Evolution, Ecology and Behavior. 3 Units
General Education Area/Graduation Requirement: Life Forms (B2)
Term Typically Offered: Fall, Spring

Designed for non-majors, this course is an introduction to the biological science behind important issues that face us today, such as those surrounding evolution, endangered species, conservation of ecosystems, and the behavior of organisms. By gaining an understanding of the scientific approach and the principles of evolution, ecology and behavior, students will be equipped to evaluate scientific developments and arguments in these and other issues as informed citizens. Lecture three hours.
Note: Not open to Biological Sciences majors or students who have received credit for BIO 1 or BIO 2.

BIO 10. Basic Biological Concepts. 3 Units
General Education Area/Graduation Requirement: Life Forms (B2)
Term Typically Offered: Fall, Spring

An intensive introductory course for non-majors who will take additional course work in biology or related disciplines, including the allied health sciences. Introduction to the biological sciences with strong emphasis on cellular structure and metabolism, molecular biology and genetics, as well as concepts and principles common to all living systems including ecology and evolution. Lecture three hours.
Note: Not open to Biological Sciences majors or students who have received credit for BIO 1 or BIO 2.

BIO 15L. Laboratory Investigations in Biology. 1 Unit
Prerequisite(s): BIO 9, BIO 10 or BIO 20.
Corequisite(s): BIO 9, BIO 10 or BIO 20.
General Education Area/Graduation Requirement: Laboratory (B3)
Term Typically Offered: Fall, Spring

Introductory laboratory investigation of the major principles of biology, including properties of all living things, the unity and diversity of organisms, structure and function of cells, energy and metabolism, genetics, ecology, evolution, and the scientific methods of investigation employed by biologists. Laboratory three hours.
Note: Not open to Biological Sciences majors or students who have received credit for BIO 1 or BIO 2.

BIO 20. Biology: A Human Perspective. 3 Units
General Education Area/Graduation Requirement: Life Forms (B2)
Term Typically Offered: Fall, Spring

Introduction to biological concepts with emphasis on their application to humans. Topics include: Evidenced-based decision making with respect to food, nutritional supplements, drugs, pathogens, and biotechnology. How heredity and evolution contribute to our understanding of personality, sex, behavior, addiction, disease, and aging is also discussed. Lecture three hours.
Note: Not open to majors in biological sciences and/or students who have received credit for BIO 10.

BIO 22. Introductory Human Anatomy. 4 Units
Prerequisite(s): BIO 1, BIO 2 or BIO 10
Term Typically Offered: Fall, Spring

Introduction to the study of the gross and microscopic structure of the human body using a systemic approach. Lecture three hours; laboratory three hours. Fee course.
Fee course.

BIO 25. Human Anatomy and Physiology I. 4 Units
Term Typically Offered: Fall, Spring

BIO 25/26 series provides an introduction to the structure and function of the major organ systems of the human body. BIO 25 offers basic terminology and concepts pertaining to the disciplines of anatomy and physiology, including structure/function relationships, homeostasis, and organizational levels; and provides an introduction to the structure and function of the muscular and nervous systems.
Note: Not open to students who have successfully completed BIO 22 and BIO 131, or an equivalent combination of separate anatomy and physiology courses. Lecture three hours; laboratory three hours. Fee course.

Fee course.

BIO 26. Human Anatomy and Physiology II. 4 Units
Prerequisite(s): BIO 25 or instructor permission.
Term Typically Offered: Fall, Spring

BIO 25/26 series provides an introduction to the structure and function of the major organ systems of the human body. BIO 26 provides an introduction to the structure and function of the cardiovascular, respiratory, renal and digestive systems, and emphasizes homeostatic control mechanisms.
Note: Not open to students who have successfully completed BIO 22 and BIO 131, or an equivalent combination of separate anatomy and physiology courses. Lecture three hours; laboratory three hours. Fee course.

Fee course.

BIO 30. Anatomy & Physiology - Brief Course. 4 Units
Prerequisite(s): Physical Education majors only
Term Typically Offered: Fall, Spring

An overview of the basic anatomy and physiology of all systems. Designed to meet the standards for the Physical Education Subject Matter Program, but may also may prepare students for study in other health-related fields.

BIO 39. Microbiology for Allied Health Students. 4 Units
Prerequisite(s): BIO 10; CHEM 5 or CHEM 6A and CHEM 6B or equivalent.
Term Typically Offered: Fall, Spring

Introduction to micro-organisms, particularly bacteria and viruses, with emphasis on health care-related applications of microbiology using case studies. Laboratory work includes aseptic techniques, methods of cultivating and identifying bacteria, demonstration of microbial properties and will provide practice with basic microbiological skills. Lecture three hours; laboratory three hours. Fee Course.
Note: Does not satisfy microbiology requirement for Biological Sciences majors.

Fee course.

BIO 100. Introduction to Scientific Analysis. 3 Units
Prerequisite(s): BIO 1, BIO 2, and STAT 1; declared Biological Sciences majors only or instructor consent.
General Education Area/Graduation Requirement: Upper Division Further Studies in Area B5, Further Studies in Area B (B5)
Term Typically Offered: Fall, Spring

Prepares students for upper division Biology coursework and careers in science using a curriculum centered on critical thinking and evidence-based instruction and activities. Covers core competencies required for the practice of science: 1) evaluative reading, 2) written and oral communication, 3) analysis/quantitative reasoning, and 4) experimental design. Online lecture two hours. In-person laboratory three hours.
Note: Course cannot be taken concurrently with or after taking BIO 167.

BIO 102. The Natural History of Plants. 3 Units
Prerequisite(s): A college course in biology or instructor permission.
Term Typically Offered: Fall, Spring

Major plant communities of California provide a framework for understanding the interrelationships of natural environments and the dominant trees and shrubs of these areas. Identification of these species and the wildflowers of the communities are emphasized in the lab and field trips. Designed for minors in biology or for those with an interest in their natural surroundings, but is acceptable for majors who have not completed BIO 112. Lecture one hour; laboratory six hours. Fee course.
Fee course.
Field trip(s) may be required.

BIO 103. Plants and Civilization. 3 Units
Prerequisite(s): BIO 10 or equivalent.
Term Typically Offered: Fall, Spring

Study of the significance of plants in the development of human civilization. Emphasis will be placed on the botanical, sociological and economic aspects of plants useful to humans. Lecture three hours.

BIO 104. Physiology of Human Reproduction. 3 Units
Prerequisite(s): BIO 1 and BIO 2, or BIO 10.
Term Typically Offered: Fall, Spring

Study of the physiology of human reproduction. Topics to be covered include: gametogenesis, the basis of fertility, conception, prenatal development, parturition, lactation and the physiology of contraception. Lecture three hours.

BIO 105. Life in the Ocean. 3 Units
General Education Area/Graduation Requirement: Further Studies in Area B (B5), Upper Division Further Studies in Area B5
Study of marine life and ocean ecosystems. Exploration of the unique adaptations of marine life, how marine organisms interact with their environment, diversity of marine habitats from coral reefs to deep sea, and conservation. Does not count toward the Biological Sciences Major.

BIO 106. Genetics: From Mendel to Molecules. 3 Units
Term Typically Offered: Fall, Spring

Introduction to the principles of genetics and scientific approaches used to define those principles. The physical basis of heredity, the impact of selective breeding and genetic engineering will be discussed. Lecture two hours; discussion one hour.
Note: BIO 10 recommended.

BIO 109. Biology of Dinosaurs. 3 Units
General Education Area/Graduation Requirement: Upper Division Further Studies in Area B5, Further Studies in Area B (B5)
Introduction to the biology of the dinosaurs. Dinosaurs came in a vast array of shapes and sizes and exemplify biodiversity. This course will examine the dinosaurs in an evolutionary framework, discussing their origin, the major lineages, phylogeny and what they look like today. The course will take advantage of the recent surge in scientific investigations into the biology of dinosaurs, such as parental care, sexual selection, group living, flight and feathers. Does not count toward the Biological Sciences Major.

BIO 112. Plant Taxonomy. 4 Units
Prerequisite(s): BIO 1 and BIO 2.
Term Typically Offered: Spring only

Spring flora of central California is used as the focus of study in the classification and identification of native vascular plants. Lecture two hours; laboratory six hours. Field trips may be required. Fee course.
Fee course.
Field trip(s) may be required.

BIO 113. Evolution and Speciation in Flowering Plants. 3 Units
Prerequisite(s): BIO 1 and BIO 2 or equivalent.
Term Typically Offered: Fall only – even years

A survey of the important tools and mechanisms used to study speciation in plants. Topics include the molecular basis of evolutionary change, intraspecific genetic variation at both the local and landscape levels, theory regarding mechanisms of speciation, and the importance of polyploidy. Readings will be from both a text and from the primary literature, and will include in-depth discussions of historical and modern studies in plant evolution. Lecture three hours.

BIO 115. Introduction to Neuroscience. 4 Units
Prerequisite(s): PSYC 2 and PSYC 8; PSYC or BIO majors only. PSYC 9 recommended.
Term Typically Offered: Fall, Spring

Investigation of the structure and function of the central nervous system including neuroanatomy and neurophysiology, sensorimotor integration. The lectures and readings emphasize the empirical questions, techniques and methods used in neuroscience research. Laboratory exercises focus on gross- and micro- neuroanatomy, models of membrane electrophysiology and motor system function. Lecture/discussion three hours; laboratory three hours.
Cross Listed: PSYC 115; only one may be counted for credit.

BIO 118. Natural Resource Conservation. 3 Units
Prerequisite(s): BIO 1 and BIO 2.
Term Typically Offered: Fall only

Introduction to the principles and practices of biological conservation. Historical development of conservation philosophy; current issues in conservation of renewable natural resources; conservation administration. Lecture three hours.

BIO 120. Biology of Aging. 3 Units
Prerequisite(s): BIO 1, BIO 2, BIO 10 or BIO 20.
Term Typically Offered: Fall, Spring

Theories of aging, cellular aging and aging effects on the various human body systems. Lecture three hours.
Note: Not open for credit to students who have previously taken BIO 131.

BIO 121. Molecular Cell Biology. 3 Units
Prerequisite(s): BIO 184
Term Typically Offered: Fall, Spring

Comparison of the cellular and molecular biology of prokaryotic and eukaryotic cells. Emphasis will be placed on membrane structures, transport phenomena, cell to cell communication, cellular reproduction, genetic architecture, gene expression and metabolism, as well as the eukaryotic endomembrane, cytoskeleton and extracellular matrix systems. Lecture three hours.

BIO 122. Advanced Human Anatomy. 4 Units
Prerequisite(s): BIO 22.
Term Typically Offered: Spring only

Gross structure of the human body using a regional approach. Lecture three hours; laboratory three hours. Fee course.
Fee course.

BIO 123. Neuroanatomy. 3 Units
Prerequisite(s): BIO 22.
Term Typically Offered: Fall only

Gross and microscopic structures of the central, peripheral and autonomic nervous systems. The lectures are correlated with laboratory exercises and demonstrations using human prosected cadaver specimens, audio-visual slide projected materials, charts and models. Lecture two hours; laboratory three hours. Fee course.
Fee course.

BIO 124. Clinical Hematology. 3 Units
Prerequisite(s): CHEM 161 and BIO 184
Term Typically Offered: Spring only

Basic principles and current clinical laboratory procedures used in the study of blood; emphasis on morphological and chemical changes in the disease processes. Lecture two hours; laboratory three hours. Fee course.
Fee course.

BIO 125. Body Fluid Analysis. 1 Unit
Prerequisite(s): CHEM 161 or instructor permission.
Term Typically Offered: Fall only

Production of body fluids (e.g., urine, cerebrospinal, pleural, peritoneal, pericardial, and synovial fluids); their normal characteristics and pathological changes will be discussed. A description of the laboratory tests used in the clinical evaluation of body fluids will also be presented.

BIO 126. Comparative Vertebrate Morphology. 3 Units
Prerequisite(s): BIO 1 and BIO 2.
Term Typically Offered: Spring only

Study of the anatomical systems of vertebrates in an evolutionary and functional context. Covers vertebrate form, function, development and phylogeny, overviews of organ systems, and how their modification founded the major events of vertebrate evolution including metamorphosis, water-to-land transition, tetrapodal locomotion, feeding and reproduction. Labs complement lectures with dissections of three representative species (shark, salamander, cat), and surveys of specializations in other forms. Lecture two hours; laboratory three hours. Fee course.
Fee course.

BIO 127. Developmental Biology. 4 Units
Prerequisite(s): BIO 2 AND BIO 184.
Term Typically Offered: Fall only

This course examines the progression of fertilized eggs of vertebrate organisms through embryonic development. This progression will be studied at biochemical, molecular, genetic, morphological and physiological levels, with an emphasis on the progressive changes that occur within cells, tissues and organs in the embryo. We will use a comparative approach between a variety of model organisms to understand similarities and differences among vertebrate and selected invertebrate species. Fee course.
Fee course.

BIO 128. Plant Anatomy and Physiology. 4 Units
Prerequisite(s): BIO 1 and BIO 2.
Term Typically Offered: Spring only

An integrative examination of our current understanding of plant structure and function. Students will apply fundamental principles of cell and molecular biology, evolution, and ecology to understand the relationships between plant anatomy and plant physiology that have enabled plants to achieve such a high level of success as primary producers on our planet. Lecture three hours, laboratory three hours. Fee course.
Fee course.

BIO 130. Histology. 3 Units
Prerequisite(s): BIO 22
Term Typically Offered: Spring only

Study of the morphology and physiology of cells in primary normal human tissues and the arrangement and adaptations of tissues in organs and organ systems. The characteristics and properties of abnormalities in human tissues will be covered if time permits. Lecture two hours; laboratory three hours.

BIO 131. Systemic Physiology. 4 Units
Prerequisite(s): CHEM 1B or CHEM 6B and BIO 1 or BIO 2 or BIO 10 or BIO 22.
Term Typically Offered: Fall, Spring

Physiology of organ systems with emphasis on control and integration of system function. Experiments using humans and selected vertebrate animal models are performed in the laboratory to illustrate functional characteristics of organ systems discussed in lecture and to provide direct experience with techniques, recording systems, and methods of data analysis commonly used in physiology and related fields. Lecture three hours; laboratory three hours. Fee course.
Fee course.

BIO 131A. Advanced Problems in Physiology. 1 Unit
Corequisite(s): BIO 131
Term Typically Offered: Fall, Spring

Advanced problem-solving in physiology designed for students concurrently enrolled in BIO 131. Students explore solutions to challenging problem sets under the direct supervision of an experienced section leader. Discussion: two hours.
Credit/No Credit

BIO 132. Neurophysiology. 3 Units
Prerequisite(s): BIO 131 or both BIO 25 and BIO 26.
Term Typically Offered: Fall, Spring

Organization and function of the nervous system will be explored. Topics include mechanisms of communication between neurons, integration of sensory and motor systems, and functional brain systems. Diseased states will be introduced, as appropriate. Lecture 3 hours.

BIO 133. Cardiovascular, Respiratory and Renal Physiology. 3 Units
Prerequisite(s): BIO 131.
Term Typically Offered: Fall, Spring

Advanced consideration of the integrated physiology of the cardiovascular, respiratory, and renal systems, including acid-base physiology. Advanced problem-solving, analysis of case studies, and interpretation of experimental findings will be included. Lecture three hours.

BIO 134. Medical Mycology. 3 Units
Prerequisite(s): BIO 139.
Term Typically Offered: Spring only – even years

Study of the morphology, cultural characteristics and classification of fungi which are pathogenic for humans, as well as fungi which appear as common contaminants. Lecture two hours; laboratory three hours. Fee course.
Fee course.

BIO 135. Endocrinology. 3 Units
Prerequisite(s): BIO 121.
Term Typically Offered: Fall only

Advanced consideration of the principles of endocrinology with special emphasis on the role of hormones in growth, metabolism, stress (including the hormonal interactions during exercise) and disease. Various endocrine disorders, will serve as the model for case studies, current literature analysis and advanced problem-solving activities. Lecture three hours.

BIO 139. General Microbiology. 4 Units
Prerequisite(s): BIO 184; CHEM 20 or CHEM 24
Term Typically Offered: Fall, Spring

Introduction to microorganisms, particularly bacteria and viruses, their physiology and metabolism. Laboratory work includes aseptic techniques, methods of cultivating and identifying bacteria, and demonstration of microbial properties. Lecture three hours; laboratory three hours. Fee course.
Fee course.

BIO 140. Medical Microbiology and Emerging Infectious Diseases. 3 Units
Prerequisite(s): BIO 39 or BIO 139.
Term Typically Offered: Spring only

Lectures, discussions, and readings regarding infectious viruses, bacteria, fungi, and parasites, with an emphasis on highly relevant pathogens including emerging infectious agents and microbes that are regionally endemic. The clinical syndrome, along with the molecular and cellular aspects of the course of infection of each pathogen will be discussed. Additionally, the history of microbiology and medicine as well as a brief overview of laboratory methods used for diagnosis will also be covered. Lecture three hours.
Note: BIO 140 cannot substitute for BIO 144 in the CLS concentration in Biological Sciences.

BIO 143. General Virology. 3 Units
Prerequisite(s): BIO 121 and BIO 139
Term Typically Offered: Spring only

Lectures and demonstrations on the fundamental characteristics and properties of plant, animal and bacterial viruses. Lecture three hours.

BIO 144. Pathogenic Bacteriology. 4 Units
Prerequisite(s): BIO 139.
Term Typically Offered: Fall only

Morphological, physiological and immunological characteristics of pathogenic bacteria. In the laboratory, pure culture studies are emphasized. Lecture two hours; laboratory six hours. Fee course.
Fee course.

BIO 145. The Diversity of Microorganisms. 4 Units
Prerequisite(s): BIO 139.
Term Typically Offered: Spring only

Isolation, cultivation and characterization of a wide variety of soil and water microbes from natural habitats using a variety of culture and non-culture based techniques; natural habitats also will be examined directly for the numbers and varieties of microbes which are present using bioinformatic and statistical tools. Lecture two hours; laboratory six hours.

BIO 149A. Immunology. 3 Units
Prerequisite(s): BIO 121 and BIO 139
Term Typically Offered: Fall only

Nature of antigens, antibodies and their reactions. The development of the immune response and its role in immunity and pathology. Lecture two hours.

BIO 149B. Immunology and Serology Laboratory. 1 Unit
Prerequisite(s): BIO 139, BIO 149A.
Term Typically Offered: Not offered

Laboratory exercises designed to provide familiarity with common clinical laboratory procedures in serology. Laboratory three hours. Fee course.
Fee course.

BIO 149C. Advanced Problems in Immunology. 1 Unit
Prerequisite(s): BIO 139 and CHEM 161.
Corequisite(s): BIO 149A.
Term Typically Offered: Fall only

Advanced problem-solving in immunology designed for students concurrently enrolled in BIO 149A. Discussions and problem sets are focused on the medical, clinical, and biotechnology applications of immunology. Discussion one hour.
Credit/No Credit

BIO 150. Forensic Biology. 3 Units
Prerequisite(s): BIO 1, BIO 2 and BIO 184.
Term Typically Offered: Spring only

Principles governing the application of biology and biological statistics to solve crimes. Topics include evidence examination and preservation, presumptive and confirmatory serological tests, hair comparison, generation and statistical analysis of mitochondrial and nuclear DNA profiles, structure and administration of the modern crime laboratory, and the role of the criminalist in the U.S. court system. Lecture two hours; laboratory three hours.
Note: Not offered every semester

BIO 151. Advanced Laboratory Techniques in Forensic Biology. 2 Units
Prerequisite(s): BIO 150 or instructor permission.
Term Typically Offered: Fall only

Laboratory exercises focusing on current research problems and skills in forensic serology, DNA typing, and court testimony. Topics will include DNA mixture and low copy number interpretation, advanced techniques in serological testing, research ethics, as well as skills for effective communication in the courtroom. Topics may also include Y-STR typing, animal and plant DNA identification and typing, microbial forensics, somatic mosaicism, ELISA specificity and sensitivity testing, and other current areas of active inquiry. Designed to prepare students for entry level positions as DNA analysts in federal, state, and local crime laboratories. Laboratory six hours. Fee course.
Fee course.

BIO 152. Human Parasitology. 3 Units
Prerequisite(s): BIO 1 and BIO 2.
Term Typically Offered: Spring only

Examines, in detail, the most important species of protozoans, flukes, tapeworms and roundworms that infect humans. Life cycles, pathology and prophylaxis constitute the principal topics in lectures. Morphology, physiology, taxonomy and diagnosis constitute the principal topics in the laboratory. Lecture two hours; laboratory three hours. Fee course.
Fee course.

BIO 156. Food Microbiology. 3 Units
Prerequisite(s): BIO 139.
Term Typically Offered: Fall, Spring

Microbiology of food fermentations, food preservation and spoilage. Lecture two hours; laboratory three hours. Fee course.
Fee course.

BIO 157. General Entomology. 4 Units
Prerequisite(s): BIO 1 and BIO 2.
Term Typically Offered: Fall only

Biology of insects and a brief consideration of other terrestrial arthropods. Includes structure, physiology, ecology, classification, economic importance, collection and preservation of insects. Lecture three hours; laboratory three hours. Fee course.
Fee course.

BIO 160. General Ecology. 3 Units
Prerequisite(s): BIO 1 and BIO 2 or BIO 1 and BIO 10; BIO 100 or ENVS 120. Fee course.
Term Typically Offered: Fall, Spring

Examination of the interrelationships among organisms and their environments. Designed for the major in Biological Sciences or related fields. Topics include the structure and function of terrestrial and aquatic ecosystems, population and community dynamics and human effects on ecosystems. Projects and field trips required. Lecture two hours; laboratory three hours.
Fee course.
Field trip(s) may be required.

BIO 162. Ichthyology: The Study of Fishes. 3 Units
Prerequisite(s): BIO 1 and BIO 2.
Term Typically Offered: Fall only – even years

Biology of fishes: structure, physiology, ecology, economic importance, propagation and classification. Methods of identification, life history study, propagation, collection and preservation. Lecture two hours; laboratory three hours. Field trips may be required. Fee course.
Fee course.
Field trip(s) may be required.

BIO 164. Amphibians and Reptiles: An Introduction to Herpetology. 3 Units
Prerequisite(s): BIO 1 and BIO 2.
Term Typically Offered: Spring only – even years

Taxonomy, natural history, ecology and distribution of amphibians and reptiles with emphasis on local forms. Lecture two hours; laboratory three hours. Field trips may be required. Fee course.
Fee course.
Field trip(s) may be required.

BIO 165. Vertebrate Zoology. 3 Units
Prerequisite(s): Bio 1, Bio 2, or Bio 10, or permission of instructor.
Term Typically Offered: Summer only

Study of vertebrate life and structure-function relationships. Exploration of the unique and diverse vertebrates of North America. Integrating multiple disciplines (ecology, biology, evolution, and biomechanics) to explore the biology and evolutionary history of vertebrates. Survey and critically test important theories and hypotheses about vertebrate zoology through literature reviews, field experiments, analyses, and presentations. Field trip required.
Field trip(s) may be required.

BIO 166. Ornithology. 3 Units
Prerequisite(s): BIO 1 and BIO 2.
Term Typically Offered: Spring only – odd years

Biology of birds: structure, physiology, ecology, behavior, and classification. Methods of life history study, ecological studies, laboratory and field identification. Lecture two hours; laboratory three hours. Field trips required. Fee course.
Fee course.
Field trip(s) may be required.

BIO 167. Quantitative Methods in Biology. 3 Units
Prerequisite(s): STAT 1 and BIO 100 or graduate status
Term Typically Offered: Spring only

Focuses on statistical hypothesis testing and experimental design in the biological sciences. Topics include the development of a hypothesis, study design and implementation, management and presentation of data, identification of data types, and appropriate use of statistical procedures. General application to a wide range of biological disciplines and will emphasize the scientific process, critical thinking skills, and the interpretation of statistical results, which will include a project culminating a scientific paper and presentation. Lecture two hours; laboratory three hours.

BIO 168. Mammalogy. 4 Units
Prerequisite(s): BIO 1 and BIO 2.
Term Typically Offered: Fall only

Biology of mammals: structure, physiology, ecology, behavior, classification. Methods of life history, laboratory and field identification, collection and preservation. Lecture three hours; laboratory three hours. Field trips required. Fee course.
Fee course.
Field trip(s) may be required.

BIO 169. Animal Behavior. 3 Units
Prerequisite(s): BIO 1 and BIO 2.
Term Typically Offered: Spring only

Introduction to the fascinating world of why animals do the things that they do. Focus is on the evolution and function of animal behavior through understanding the costs and benefits of different behavior including foraging, fighting and reproduction. Lecture two hours; laboratory three hours. Fee course.
Fee course.

BIO 170. Advanced Nutrition and Metabolism. 3 Units
Prerequisite(s): CHEM 161, FACS 113; or instructor permission.
Term Typically Offered: Spring only – odd years

Study of the physiologic function of carbohydrates, lipids, protein and micronutrients including integrated metabolism, transport, regulation and relation to inborn errors/chronic disease. Introduction to gene-nutrient interaction.
Cross Listed: FACS 170; only one may be counted for credit.

BIO 173. Principles of Fisheries Biology. 3 Units
Prerequisite(s): BIO 160, STAT 1.
Term Typically Offered: Fall only – odd years

Introduction to the biological principles basic to fisheries science, including enumeration, recruitment, growth, abundance and mortality. Mathematics, computer modeling, and field methods will be used to understand natural populations and the impact of fishing on those populations in keeping with modern approaches to fisheries science which are grounded in population ecology and conservation biology. Lecture two hours; laboratory three hours. Fee course.
Fee course.

BIO 178. Molecular Ecology. 4 Units
Prerequisite(s): BIO 184
Corequisite(s): BIO 188
Term Typically Offered: Fall only

A survey of the use of molecular tools to understand ecological questions. Lecture will focus on the background and history of the use of molecular tools in ecological settings, including application of molecular tools to conservation of natural resources. Laboratory will include techniques for both wet lab and analysis of molecular data, including interpretation of results. Students will complete a capstone-style project that will culminate in the production of a research proposal.

BIO 179. Conservation Biology & Wildlife Management. 3 Units
Prerequisite(s): BIO 100. BIO 160 recommended. Or instructor permission. Paired
Term Typically Offered: Spring only

Study of human effects and management of ecological systems, including populations, communities, and ecosystems. Topics include population and biodiversity responses to human activities, endangered species management, reserve design, and restoration. Paired course with Bio 279.
Note: Lecture two hours; laboratory and fieldwork three hours; meets in the same location with the same instructor as Bio 279; course cannot be taken concurrently with or after taking BIO 279; Bio 279 cannot be taken in the graduate program after completing Bio 179.

BIO 180. Advanced Molecular Biology. 4 Units
Prerequisite(s): BIO 121 and BIO 184.
Term Typically Offered: Fall, Spring

Examination of the structure of genes and genomes, the mechanisms by which they change, and the use of evolutionary relationships to understand function. Mechanisms of the regulation of gene expression from gene to phenotype and the tools used o study these processes. Applications of molecular tools in medicine and biotechnology and the ethics around these approaches. Lecture two hours, laboratory six hours.

BIO 183. Cancer Biology. 3 Units
Prerequisite(s): BIO 121 and BIO 184.
Term Typically Offered: Fall only

Study of cancer from the molecular level to the effect on whole tissues and organs. Topics to be covered include the classification and nomenclature of cancers, the process leading up to the formation of a cancer, the possible causes of cancer, and possible treatment. Lecture two hours.

BIO 183A. Advanced Problems in Cancer Biology. 1 Unit
Prerequisite(s): BIO 121 and BIO 184 and BIO 183 or instructor permission; BIO 183 may be taken concurrently
Term Typically Offered: Fall, Spring

Literature searches and discussions are focused on medical, clinical, and biotechnological applications of Cancer Biology.

BIO 184. General Genetics. 4 Units
Prerequisite(s): BIO 1 and BIO 2; declared major in Biological Sciences, Biochemistry, Chemistry or instructor consent
Term Typically Offered: Fall, Spring, Summer

Principles of inheritance as they relate to microorganisms, plants, animals and humans. Genetic mechanisms are analyzed according to evidence derived from both classical and current research. The nature, structure, and function of the genome are considered at the molecular level. Lecture three hours; laboratory three hours. Fee course.
Fee course.

BIO 185. Topics in Biology. 3 Units
Prerequisite(s): BIO 10 or both BIO 1 and BIO 2; CHEM 20.
Term Typically Offered: Fall, Spring

Current topics in cellular, developmental and/or molecular biology. Topics will vary. May be taken more than once provided that topics are different. Lecture three hours.

BIO 186A. Cell and Molecular Biology Seminar. 1 Unit
Prerequisite(s): BIO 10 or both BIO 1 and BIO 2.
Term Typically Offered: Fall, Spring

Series of at least 10 seminars in cell and molecular biology. Topics within each seminar will vary each semester.
Note: May be repeated for credit. No more than one unit of BIO 186 may be counted toward the upper division major requirement.

Credit/No Credit

BIO 186B. Ecological and Environmental Issues Seminar. 1 Unit
Prerequisite(s): BIO 10 or both BIO 1 and BIO 2.
Term Typically Offered: Fall only

Series of at least 10 seminars in ecological and environmental issues. Topics within each seminar will vary each semester.
Note: May be repeated for credit. No more than one unit of BIO 186 may be counted toward the upper division major requirement. Cross Listed: ENVS 186B; only one may be counted for credit.

Credit/No Credit

BIO 186C. Introduction to Health Careers Seminar. 1 Unit
Term Typically Offered: Fall, Spring

Designed for pre-health professional students who are in the process of researching traditional and non-traditional health professions and careers. This course consists of at least 10 seminars presented by various practicing health professionals, health professional students, and health professional school admissions officers. Topics vary each semester. One hour per week.
Credit/No Credit

BIO 187. Advanced Cell Biology. 4 Units
Prerequisite(s): BIO 121 and BIO 184.
Term Typically Offered: Spring only

Advanced cellular and molecular biology of eukaryotic cells. Comparison to prokaryotic organism will be made as needed to illustrate key concepts. Emphasis will be placed on cellular functions and utilize two or more cellular systems; including cell to cell communication, regulation of gene expression, uptake and secretion, regulation of cytoskeletal configuration, cell migration and cellular reproduction. Lecture two hours, laboratory six hours.

BIO 188. Evolution. 3 Units
Prerequisite(s): BIO 184 or instructor permission.
Term Typically Offered: Fall, Spring

General survey of evolutionary processes: mechanisms of evolutionary change, adaptation and history of life. Designed for biological sciences majors. Lecture three hours.

BIO 194. Biology-Related Work Experience. 6 - 12 Units
Term Typically Offered: Fall, Spring

Supervised employment in a biology or biology-related company or agency arranged through the Department of Biological Sciences and the Cooperative Education Program office. Requires preparation of application packet, completion of a three to six month, full-time or part-time work assignment, and a written report.
Note: Open only to upper division or graduate students with appropriate preparation. Consent of Department Cooperative Education Committee required, and Committee will determine the number of units to be granted. Students may enroll for no more than 12 total units, and units may not be used to meet biology major or graduate course work requirements.

Credit/No Credit

BIO 195. Biological Internship. 1 - 2 Units
Prerequisite(s): Department chair and instructor (representing the appropriate biological discipline) permission.
Term Typically Offered: Fall, Spring

Supervised work-learn experience in biology with a public or private organization. Up to 4 units may be taken. No more than 2 units from BIO 195, BIO 197 and BIO 199 combined can be applied to the biological sciences upper division major requirement.
Credit/No Credit

BIO 195D. Dental Internship. 1 - 2 Units
Prerequisite(s): Department chair and instructor (representing the appropriate preprofessional discipline) permission.
Term Typically Offered: Fall, Spring

Supervised non-paid internship experience in the medical-related and business-related aspects of dentistry. Includes a volunteer experience in the community. No more than 2 units from BIO 195, BIO 197 and BIO 199 combined can be applied to the biological sciences upper division major requirement.
Note: 1 unit = 40 hours of participation/semester and 2 units = 80 hours of participation/semester; May be repeated for up to 4 units of credit .

Credit/No Credit

BIO 195M. Medical Internship. 2 Units
Prerequisite(s): Department Chair, Instructor and Placement Agency's permission required.
Term Typically Offered: Fall, Spring

Supervised non-paid internship experience in multiple aspects of health care. Includes a volunteer experience in the community, supplemental readings, and a presentation on current issues in medicine and health education. No more than 2 units of BIO 195, BIO 197 and BIO 199 combined may be applied to the Biological Sciences upper division major requirement.
Note: 80 hours of participation/semester

Credit/No Credit

BIO 195P. Pharmacy Internship. 1 - 2 Units
Prerequisite(s): Department Chair, Instructor, and Placement Agency permission required.
Term Typically Offered: Fall, Spring

Supervised non-paid internship experience in pharmacy. Includes a volunteer experience in the community. No more than 2 units from BIO 195, BIO 197 and Bio 199 combined can be applied to the biological sciences upper division major requirement. May be repeated for up to 4 units of credit. 1.0-2.0 units (40-80 hours of participation/semester).
Credit/No Credit

BIO 195T. Teaching Internship. 1 - 2 Units
Prerequisite(s): Department chair and instructor permission.
Term Typically Offered: Fall, Spring

Supervised non-paid internship experience in K-12 teaching. Includes regular meetings with supervising teacher and submission of a field experience journal. May be repeated for credit.
Note: No more than 2 units from BIO 195, 197 and 199 combined can be applied to the biological sciences upper division major requirement.

Credit/No Credit

BIO 197A. Laboratory Teaching Assistant. 1 - 2 Units
Prerequisite(s): Department Chair and instructor permission.
Term Typically Offered: Fall, Spring

Supervised experiences will include aspects of laboratory preparation and aspects of teaching biology laboratory courses. Conferences and laboratory experiences four to eight hours weekly. Admission requires approval of professor and Department Chair.
Note: May be taken more than once, but no more than 2 units from BIO 195, BIO 197 and BIO 199 combined can be applied to the Biological Sciences upper division major requirement.

BIO 197B. Laboratory Techniques. 1 - 2 Units
Prerequisite(s): Department Chair and instructor permission.
Term Typically Offered: Fall, Spring

Supervised laboratory experiences for advanced students in the organization and techniques for operation of a basic sciences laboratory. Conferences and laboratory experiences four to eight hours weekly. Admission requires approval of professor and Department Chair.
Note: May be taken more than once, but no more than 2 units from BIO 195, BIO 197 and BIO 199 combined can be applied to the Biological Sciences upper division major requirement.

Credit/No Credit

BIO 197C. Co-curricular Activities in Biology. 1 - 2 Units
Term Typically Offered: Fall, Spring

Students may earn BIO 197C credit by participating as tutors and/or section or discussion leaders for biological sciences classes or teaching as voluntary instructors or tutors in K-12 courses or programs offered by other community organizations. Participation requires four to eight hours weekly. Admission requires approval of professor and Department Chair.
Note: May be taken more than once, but no more than 2 units from BIO 195, BIO 197 and BIO 199 combined can be applied to the Biological Sciences upper division major requirement.

Credit/No Credit

BIO 197D. Advanced Laboratory Exploration. 1 - 2 Units
Prerequisite(s): BIO 197A and instructor permission.
Term Typically Offered: Fall, Spring

Advanced, supervised experiences that explore the science behind laboratory experiences and discussion regarding aspects of specific laboratories that promote understanding of scientific content. Conferences and laboratory experiences four to eight hours weekly; written assignments and/or oral presentations required. Admission requires approval of professor and Department Chair.
Note: No more than 2 units from BIO 195, BIO 197, BIO 199 combined may be applied to the Biological Sciences upper division major requirement.

BIO 197E. Intermediate Lab Techniques. 1 - 2 Units
Prerequisite(s): BIO 197B and instructor or Department Chair permission
Term Typically Offered: Fall, Spring

Supervised laboratory experiences for skilled students in the organization and techniques for operation of a basic sciences laboratory. Conferences and laboratory experiences four to eight hours weekly. Admission requires approval of instructor and Department Chair.
Note: May be taken more than once, but no more than 2 units from BIO 195, BIO 197 and BIO 199 combined may be applied to the Biological Sciences upper division major requirement.

Credit/No Credit

BIO 197F. Advanced Lab Techniques. 1 - 2 Units
Prerequisite(s): BIO 197B and instructor permission.
Term Typically Offered: Fall, Spring

Advanced supervised laboratory experiences for skilled students in the organization and techniques for operation of a basic sciences laboratory. Conferences and laboratory experiences four to eight hours weekly. Admission requires approval of instructor and Department Chair.
Note: May be taken more than once; no more than 2 units from BIO 195, BIO 197 and BIO 199 combined may be applied to the Biological Sciences upper division major requirement.

Credit/No Credit

BIO 198A. Honors Proseminar and Research. 2 Units
Prerequisite(s): Open only to honors students in biological sciences who have an overall GPA of 3.25 and a minimum of 3.0 GPA in biology courses (at least six units of upper division biology excluding BIO 106, BIO 108, BIO 194, BIO 195, BIO 197 and BIO 199).
Term Typically Offered: Fall, Spring

Contemporary topics in biology selected by students in the course will form the basis for an introduction to scientific journals, the scientific method, and research as a professional pursuit. Each student develops a refined research proposal and prepares a seminar summarizing the proposal and the current state of knowledge in the topic area. Students will develop and refine their methodology under the direction of a faculty sponsor.

BIO 198B. Honors Research and Seminar. 2 Units
Prerequisite(s): BIO 198A.
Term Typically Offered: Fall, Spring

Directed research involving completion of an independently conducted research project for which a proposal and methodology was developed in BIO 198A. Data collection, summary and analysis, and formulation of conclusions based on the data will be discussed periodically with a faculty sponsor. Culmination will consist of preparation of an undergraduate thesis, poster and presentation of a seminar summarizing results and conclusions.
Note: Open only to honors students in Biological Sciences. Fee course.

Fee course.

BIO 199A. Introductory Undergraduate Research. 1 - 2 Units
Prerequisite(s): Department Chair and instructor permission.
Term Typically Offered: Fall, Spring

Student conducts introductory, independent laboratory or field research on an original question. Research must culminate in a formal report. Weekly meetings may be required. Students must have a research prospectus approved by faculty mentor and Department Chair.
Note: May be taken more than once, no more than 2 units from BIO 195, BIO 197 and BIO 199 combined may be applied to the Biological Sciences upper division major requirement.

BIO 199B. Directed Readings. 1 - 2 Units
Prerequisite(s): Department Chair and instructor permission.
Term Typically Offered: Fall, Spring

Directed Readings on a topic in Biology culminating in a research paper. Admission requires submission of a prospectus approved by the faculty member under whom the work is to be conducted and the Department Chair.
Note: May be taken more than once, but no more than 2 units from BIO 195, BIO 197 and BIO 199 combined can be applied to the Biological Sciences upper division major requirement.

BIO 199C. Intermediate Undergraduate Research. 1 - 2 Units
Prerequisite(s): Department Chair and instructor permission.
Term Typically Offered: Fall, Spring

Student conducts independent laboratory or field research on an original question. Research must culminate in a formal report. Weekly meetings may be required. Students must have a research prospectus approved by faculty mentor and Department Chair.
Note: May be taken more than once; no more than 2 units from BIO 195, BIO 197 and BIO 199 combined may be applied to the Biological Sciences upper division major requirement.

BIO 199D. Advanced Undergraduate Research. 1 - 2 Units
Prerequisite(s): Department Chair and instructor permission.
Term Typically Offered: Fall, Spring

Advanced laboratory or field research on an original question. The research must culminate in a formal report. Weekly meetings may be required. Students must have a prospectus approved by the faculty member and the Department Chair.
Note: May be taken more than once; no more than 2 units from BIO 195, BIO 197 and BIO 199 combined may be applied to the Biological Sciences upper division major requirement.

BIO 214. Advanced Plant Ecology. 3 Units
Prerequisite(s): BIO 160.
Term Typically Offered: Fall, Spring

Fundamental properties of plant populations; population regulation; community productivity and structure; a study of ecotypic and ecoclinal variation in plant populations. Lecture one hour; laboratory and field six hours.

BIO 220. Introduction to Scientific Inquiry. 2 Units
Term Typically Offered: Fall, Spring

Graduate level introduction to scientific inquiry in the biological sciences. Students learn to apply the scientific method, critically evaluate the scientific literature, initiate their graduate project, and develop written and oral scientific presentation skills. Lecture two hours.
Note: Graduate Writing Intensive (GWI).

BIO 220A. Foundations in Scientific Inquiry. 3 Units
Term Typically Offered: Fall only

Introduces the foundations of scientific inquiry at the graduate level. Students learn how to apply the scientific method, obtain and critically evaluate the scientific literature, design experiments, interpret and present scientific data, and initiate their thesis research or project. Lecture three hours.

BIO 220B. Scientific Writing and Communication. 3 Units
Prerequisite(s): BIO 220A or instructor permission
Term Typically Offered: Spring only

Graduate level written and oral scientific presentation skills aimed at preparing students for the creation and delivery of their thesis/project proposal in the Biological Sciences. Topics include proper structure, organization, and tone in scientific writing, writing concisely, effective peer review and self-editing, and communicating complex scientific information in different forms. Lecture three hours.

BIO 221A. Cell and Molecular Methods and Techniques. 2 Units
Prerequisite(s): BIO 220 (may be taken concurrently).
Term Typically Offered: Spring only

Introduction to research methods in molecular and cellular biology. Students learn both cell and molecular techniques in the context of hypothesis-driven research to answer questions relating to a specific gene and cellular system. Experimental design and commonly used laboratory techniques will be explored. Two three hour laboratory periods. Fee course.
Fee course.

BIO 221B. Methods in Ecology, Evolution and Conservation. 2 Units
Prerequisite(s): BIO 167, BIO 220 (may be taken concurrently).
Term Typically Offered: Spring only

Introduction to research methods in ecology, evolution and conservation biology. Students learn field and laboratory techniques with a variety to taxa in a range of local ecosystems. Students will work with several faculty conducting research projects. Topics will include developing hypotheses, experimental design, study implementation, and statistical analyses. Students will be expected to present findings in oral and written form. Two three hour laboratory periods. Fee course.
Fee course.

BIO 221C. Exploration of Biological Methodology. 3 Units
Term Typically Offered: Fall, Spring

Intended for students in the MA grant proposal track, this course explores a selected topic from multiple scientific perspectives. A discovery-based laboratory project using cell and molecular techniques complimented with lectures, discussions and field trips that investigate the ecological, environmental, and evolutionary aspects of the same topic. The laboratory project will focus on a current biological topic (such as genetically modified organisms) in accordance with the instructor's interests and expertise. One hour lecture, six hours lab per week.
Note: Not open to students in the Master of Science in Molecular and Cellular Biology Concentration.

Field trip(s) may be required.

BIO 222. Molecular Biology. 3 Units
Prerequisite(s): BIO 184, CHEM 161.
Term Typically Offered: Fall, Spring

Processes and control of DNA replication, transcription, and translation developed from a consideration of the current literature. Lecture three hours.

BIO 223. Human Molecular Genetics. 3 Units
Prerequisite(s): BIO 184 and CHEM 161.
Term Typically Offered: Fall, Spring

In-depth study of the molecular basis of human disease, emphasizing current experimental approaches and technologies. Topics include the isolation and analysis of disease genes, the influence of teratogans and random environmental events on human embryonic development, the molecular and biochemical consequences of mutagenesis, and ethical issues that currently surround the field. Lecture 3 hours.

BIO 224. Genomics, Proteomics, and Bioinformatics. 3 Units
Prerequisite(s): BIO 184, BIO 222 and graduate status or instructor permission.
Term Typically Offered: Fall, Spring

Examination of current approaches in structural genomics, functional genomics and proteomics, and the bioinformatics tools utilized to understand genome organization, the regulation of gene expression, gene function and the evolutionary relationships within and between genomes. Lecture two hours; laboratory 3 hours.

BIO 225. Stem Cell Biology and Manufacturing Practices. 1 Unit
Prerequisite(s): Graduate status and instructor permission.
Term Typically Offered: Fall, Spring

Graduate level introductory course in human stem cell biology with specific emphasis on adult, embryonic, and induced pluripotent stem cells. Topics will include how stem cells are isolated or generated, how they are cultured, and how they are used for regenerative therapies. In addition, students will learn about Good Manufacturing Practice (GMP) and how to manufacture human stem cells.

BIO 227. Development and Regenerative Medicine. 3 Units
Prerequisite(s): Graduate status and instructor permission.
Term Typically Offered: Fall, Spring

Examines the processes of cellular development in the embryo and adult with a focus on stem cells. Stem cells will be studied at the biochemical, molecular, genetic, epigenetic, cellular and physiological level, with an emphasis on their roles in promoting organismal health and disease. Current research and clinical applications will be examined, along with the bioethics, policies and politics of their use.

BIO 245. Host/Pathogen Interactions. 3 Units
Prerequisite(s): BIO 121, BIO 139, BIO 184. Courses recommended but not required: BIO 144, BIO 149, BIO 180.
Term Typically Offered: Fall, Spring

Critical reading and discussion of current literature on host/pathogen interactions. Topics to be covered include: alteration of host intracellular trafficking, subversion of cell cytoskeleton for invasion, intracellular survival mechanisms, pathogen-induced cell killing, and evasion and subversion of the host immune system.

BIO 247. Contemporary Topics in Immunology. 2 Units
Prerequisite(s): BIO 149A or instructor permission.
Term Typically Offered: Fall, Spring

Readings and discussions of current literature emphasizing new field developments and controversies. Lecture two hours.

BIO 260. Advanced Ecology. 3 Units
Prerequisite(s): BIO 160 or equivalent.
Term Typically Offered: Fall, Spring

Principles and applications of theoretical and field ecology as they apply to populations, communities and ecosystems.

BIO 269. Behavioral Ecology. 3 Units
Prerequisite(s): BIO 160 or instructor permission.
Term Typically Offered: Fall, Spring

Advanced study of animal behavior focusing on the life history consequences of social organization, spacing systems, sexual behavior, reproductive ecology, feeding ecology, competitive interactions and predator-prey interactions.

BIO 273. Advanced Fishery Biology and Management. 3 Units
Prerequisite(s): BIO 173 or instructor permission.
Term Typically Offered: Fall, Spring

Critical review and evaluation of current techniques and concepts relating to the management, protection, and improvement of fishery resources. Lecture three hours.

BIO 279. Conservation Biology and Wildlife Management. 3 Units
Prerequisite(s): BIO 160; or instructor permission.
Term Typically Offered: Spring only

Advanced study of human effects and management of ecological systems, including populations, communities, and ecosystems. Topics include population and biodiversity responses to human activities, endangered species management, reserve design, and restoration. Emphasis on the critical evaluation, review, and presentation of conservation literature and issues. Paired course with Bio 179.
Note: Lecture two hours; laboratory and fieldwork three hours; meets in the same location with the same instructor as Bio 179; course cannot be taken concurrently with or after taking BIO 179; Bio 279 cannot be taken in the graduate program after completing Bio 179. Field Trip(s).

Field trip(s) may be required.

BIO 280. Advanced Molecular Biology. 4 Units
Term Typically Offered: Fall, Spring

Advanced examination of the structure of genes and genomes, the mechanisms by which they change, and the laboratory tools used to study and understand gene function. Analysis of the molecular mechanisms of gene expression, their regulation, phenotypes, and the tools used to study these processes. Application of molecular tools in medicine and biotechnology and the ethics of these approaches. Emphasis on the critical evaluation, review, and presentation of molecular biology research literature. Paired with Bio 180. Fee course. Personal Protective Equipment Required.
Note: Lecture two hours, laboratory six hours.

Fee course.

BIO 282. Evolution. 3 Units
Prerequisite(s): Classified graduate standing in Biological Sciences
Term Typically Offered: Fall only

Introduction to evolutionary concepts and perspectives and their application to a variety of topics outside of evolutionary biology through discussion of peer-reviewed literature. Students will develop skills through group discussion, writing and presentation.

BIO 283. Biogeography. 3 Units
Term Typically Offered: Fall, Spring

Study of the past and present plant and animal distributions, and the geologic, climatic and ecologic factors involved in their migration, establishment and extinction. Lecture/discussions three hours.

BIO 285. Topics in Biology. 3 Units
Prerequisite(s): Graduate status or instructor permission.
Term Typically Offered: Fall, Spring

Readings and discussions of current literature emphasizing new developments and controversies in a comparatively narrow range of biological topics. Topics will vary with each offering, encompassing one recognized specialty in biology. May be repeated for credit when the topics vary.

BIO 293. Research Conference. 2 Units
Prerequisite(s): Department Chair and instructor permission.
Term Typically Offered: Fall, Spring

Presentation and discussion of graduate student and faculty research and current literature with emphasis on critical evaluation of research design, data analysis and presentation techniques.
Note: Discussion two hours. May be taken twice for credit. Only two units may be applied to the University's requirement for 200-level courses; May be repeated for up to 4 units of credit.

Credit/No Credit

BIO 294A. Seminar in Molecular and Cellular Biology. 1 Unit
Prerequisite(s): Student must be a Biology major at the master's level to enroll in this class and/or have instructor permission.
Term Typically Offered: Fall, Spring

Review and discussion of scientific literature in cell and molecular biology. Seminar topics will vary by semester.
Note: May be repeated for up to 4 units of credit.

Credit/No Credit

BIO 294B. Seminar in Ecology, Evolution and Conservation. 1 Unit
Prerequisite(s): Student must be a Biology major at the master's level to enroll in this class and/or have instructor permission.
Term Typically Offered: Fall, Spring

Review and discussion of scientific literature in ecology, evolution, and conservation biology. Seminar topics will vary by semester.
Note: May be repeated for up to 4 units of credit.

Credit/No Credit

BIO 294C. Seminar In Scientific Communication. 1 Unit
Prerequisite(s): Student must be a Biology major at the master's level to enroll in this class and/or have instructor permission. Graded: Credit / No Credit. Units: 1.0.
Term Typically Offered: Fall, Spring

Review, discussion, and evaluation of scientific communication skills and techniques, with emphasis on oral presentation of the thesis or project proposal and delivery of the graduate exit seminar. Prerequisite: Student must be a Biology major at the master's level to enroll in this class and/or have instructor permission.
Credit/No Credit

BIO 297A. Teaching Biology Seminar. 1 Unit
Prerequisite(s): Acceptance in the GTA Program or instructor permission.
Term Typically Offered: Fall only

Highly recommended training for graduate students who wish to participate in the Department's Graduate Teaching Associate (GTA) Program and others interested in teaching biology. Weekly seminar/discussion session covers educational theory, practical instructional strategies, and faculty policies and regulations for teaching biology courses, with a focus on laboratories. Lecture/discussion.
Credit/No Credit

BIO 297B. Laboratory Teaching. 1 Unit
Prerequisite(s): Acceptance in the GTA Program or instructor permission.
Term Typically Offered: Fall, Spring

Training for graduate students admitted to the Graduate Teaching Associate (GTA) Program. Students assist in teaching three hours of biology laboratory weekly under the supervision of a laboratory instructor. Laboratory three hours. Not applicable toward 18 unit 200-level coursework requirement.
Credit/No Credit

BIO 299. Problems in Biological Sciences. 1 - 4 Units
Term Typically Offered: Fall, Spring

Library research, short-term original research, technique development, or thesis research site selection and preliminary field observations. Culminating experience will be in the format of a scientific paper, annotated bibliography, demonstration of technique mastery, or oral presentation. Enrollment requires classified graduate status and approval of the project by a faculty supervisor and the Department Chair.
Credit/No Credit

BIO 500. Master's Thesis. 4 - 6 Units
Term Typically Offered: Fall, Spring

Completion of a thesis approved for the Master's degree. Should be taken in final semester prior to the completion of all requirements for the degree. Pre-requisite: Advanced to candidacy and chair permission of his/her thesis committee.

BIO 502. Master's Project. 3 Units
Term Typically Offered: Fall, Spring

Completion of a written project based on a research problem in biology approved for the MA in Biological Sciences. Should be taken in final semester prior to the completion of all requirements for the degree.

BIO 633. Human Gross Anatomy for Physical Therapists. 3 Units
Prerequisite(s): BIO 22 or instructor permission.
Corequisite(s): PT 600, PT 602, PT 608, PT 630.
Term Typically Offered: Fall, Spring

Study of the gross anatomy of selected regions of the human body. Emphasis will be placed on musculoskeletal, neurovascular and anatomy of the joints of the back, thoracic wall, abdominal wall, upper limb and lower limb. Anatomical relationships will be reinforced through study of cross-sectional anatomy. Lecture two hours; lab three hours.
Note: Course designed for students enrolled in the Doctor of Physical Therapy Program.