BIOL-BIOLOGY

BIOL 1003 Contemporary Issues in Biology 3 Credit Hours
An introduction to biology, focusing on the scientific background needed to understand selected issues related to cells, genetics and inheritance, evolution and ecology. Not open to students with credit for BIOL 1005, BIOL 1013, BIOL 1114, BIOL 1124, BIOL 1134, or PBIO 1114. Cannot be used for major credit in Biology, Microbiology, or Plant Biology. (F, Sp) [II-NL].

BIOL 1005 Concepts in Biology 5 Credit Hours
Prerequisite: None, but high school or college chemistry is recommended. An introduction to the life sciences, focusing on the structure and function of organisms and their relationship to the environment. Fulfills general education laboratory science requirement. Not open to students with credit for BIOL 1003 or BIOL 1134, or PBIO 1114, BIOL 1114 or BIOL 1124. Cannot be used for major credit in Biology, Plant Biology, or Microbiology. Field trips. Laboratory. (F, Sp) [II-LAB].

BIOL 1013 Introduction to Biology 3 Credit Hours
Introductory survey of the fundamental concepts that underlie biological phenomena from the cellular to the ecosystem level. Not open to students with credit for 1003, 1005, or 1134, or Zoology 1114, or Zoology 1124. Cannot be used for major credit in Zoology, Botany or Microbiology. (F, Sp) [II-NL].

BIOL 1114 Introductory Zoology 4 Credit Hours
Major biological principles and concepts as illustrated in the structure, function and evolution of animals. Emphasis is on self-regulatory mechanisms, especially in the vertebrates, and their adaptive significance. (F, Sp, Su) [II-NL].

BIOL 1121 Introductory Zoology Lab 1 Credit Hour
Prerequisite: previous completion or concurrent enrollment in 1114. Laboratory study of structure and development of organ systems. Experiments on physiological process of selected vertebrates and invertebrates. (F, Sp, Su) [II-LAB].

BIOL 1124 Intro Biol: Molecule/Cell/Phys 4 Credit Hours
Content is focused toward life science majors. Major principles and concepts are presented in the function and physiology of animals, plants, fungi and microbes. Emphasis is on biological chemistry, cell structure and function, cellular energetics, molecular genetics, homeostasis and physiology. Includes biological laboratory experience with emphasis on critical thinking and problem solving, and topics include biochemistry, molecular genetics, cell processes and physiology. Laboratory. (F) [II-LAB].

BIOL 1134 Introductory Biology: Evolution, Ecology and Diversity 4 Credit Hours
Prerequisite: Life science majors only. Major biological principles and concepts as illustrated in a survey of the diversity, behavior, and ecological functions of animals, plants, fungi, and microbes. Emphasis is on evolution, ecology, and diversity. Will include biological laboratory experience with emphasis on problem solving. Problems will be derived from topics in evolution, ecology, and diversity. Will include training in scientific procedures, including laboratory technical skills, writing skills, and introduction to statistical analysis. Recitation will include discussion and case study analysis of the major biological principles presented in the lecture within the context of health and the environment. Will involve problem sets, primary journal articles, and writing assignments. Includes both online and classroom activities. Laboratory (Sp) [II-LAB].

BIOL 1203 The Age of Dinosaurs 3 Credit Hours
(Crosslisted with GEOL 1203) Introduction to basic principles and theories in biology (evolution, systematics, vertebrate morphology and relationships) and geology (geologic time, earth history, plate tectonics, sedimentation and stratigraphy), focusing on the evolutionary history of Dinosauria. May not be counted for major coursework in Biology or Geology. (F) [II-NL].

BIOL 2013 Evolution 3 Credit Hours
Prerequisite: ZOO/BIOL 1124, or ZOO/BIOL 1114 and ZOO/BIOL 1121; and Biology 1134. Process of evolutionary change. Topics include origin of species, evolution above the species level, major transitions of life on earth, application of evolutionary principles in medicine and conservation. (F, Sp)

BIOL 2103 Everyday Evolution 3 Credit Hours
Prerequisite: sophomore standing. Overview of the on-going processes of biological evolution, with emphasis on how current and past evolution affects our daily life (e.g., in agriculture, medicine, the law, conservation, and human social interactions). Processes of the origin of biodiversity and species extinction are examined within the context of life's past history on earth and prospects for its future. Not available for major credit in Plant Biology, Microbiology or Biology. (Irreg. Every other year) [II-NL].

BIOL 2124 Human Physiology 4 Credit Hours
Prerequisite: BIOL 1114 and BIOL 1121 with a grade of C or better, or BIOL 1124 with a grade of C or better; a course in chemistry or physics with a grade of C or better. May not be applied for biology major credit. Open only to majors in nursing, physical therapy, health and exercise science, and selected fields. See http://biology.ou.edu/human_anatomy-physiology.htm for complete list. Function of vertebrate organ systems in homeostasis. Circulation, digestion, endocrine and nervous control, metabolism, muscle action and respiration, with emphasis on humans. Laboratory (F, Sp, Su)

BIOL 2234 Introduction to Human Anatomy 4 Credit Hours
Prerequisite: BIOL 1114 and BIOL 1121 with a grade of C or better, or BIOL 1124 with a grade of C or better, sophomore standing. (Cannot be enrolled concurrently with BIOL 2255). Open only to majors in health and exercise science, physical therapy, nursing and selected fields. See http://biology.ou.edu/human_anatomy-physiology.htm for complete list. An introduction to the gross morphology of the human body. The course will use a lab/lecture format with extensive use of models, videos, and computer-assisted instruction as well as prosected cadavers. Not for biology major credit. (F)

BIOL 2255 Human Anatomy 5 Credit Hours
Prerequisite: BIOL 1114 and BIOL 1121 with a grade of C or better, or BIOL 1124 with a grade of C or better, sophomore standing. (Cannot be enrolled concurrently with BIOL 2234). Open only to majors in health and exercise science, physical therapy, nursing and selected fields. See http://biology.ou.edu/human_anatomy-physiology.htm for complete list. The development and gross morphology of the human body and its systems. Laboratory dissection of human cadavers. Not for biology major credit. Laboratory (F, Sp)

BIOL 2404 Ecology/Environmental Quality 4 Credit Hours
(Crosslisted with PBIO 2404) Prerequisite: sophomore standing. Study of ecological principles and their applications to human systems, study of population, air pollution, water pollution, energy issues, etc. Laboratory exercises focus on learning scientific methods of measurement of environmental quality factors. Laboratory (Sp) [II-LAB].

BIOL 2913 Intro to Quantitative Biology 3 Credit Hours
Prerequisite: 1114 and 1121, or 1124, or Biology 1134, Mathematics 1523 or 1643 or higher, or permission of instructor. The connections between basic mathematics and how biological data are organized, tested, and interpreted. Includes review of probability theory, introduction to parametric and non-parametric biostatistics, fundamentals of experimental design, and sketches of how optimality theory can be used to generate biological questions. (Sp even-numbered years)

BIOL 2970 Special Topics 3 Credit Hours
1 to 3 hours. Prerequisite: BIOL 1134 and BIOL 1124; or BIOL 1134 and BIOL 1114 and BIOL 1121; or BIOL 1124, BIOL 1134, or BIOL 1114 and BIOL 1121, and either Plant Biology 1114 or Chemistry 1315; or permission of instructor. May be repeated with change of content; maximum credit nine hours. Seminar or special topics course for content not currently offered in regularly scheduled courses. May include library and/or laboratory research, and field projects. (Irreg.)

BIOL 3054 Invertebrate Zoology 4 Credit Hours
Prerequisite: ZOO/BIOL 1114 and ZOO/BIOL 1121, or BIOL 1134. A survey of the invertebrate animals featuring their classification, morphology, life history, ecology, conservation considerations and evolution. Laboratory (Sp)

BIOL 3063 Veterinary Entomology 3 Credit Hours
Prerequisite: ZOO/BIOL 1124, or ZOO/BIOL 1114 and ZOO/BIOL 1121; and Biology 1134. The study of insects and their near relatives, such as ticks, as they relate to the causation of economic loss and transmission of disease organisms in livestock and companion animals. Insect biology, disease transmission, and methods of control will be stressed in lecture. Laboratory emphasizes 1) collection, preservation, and pathogens, and 2) toxicological methods used to control and evaluate insecticides and acaricides. Laboratory (December Intersession)

BIOL 3073 Medical Entomology 3 Credit Hours
Prerequisite: 1114 and 1121, or Biology 1134. Medical entomology investigates the relationship of insects and other arthropods to the health of humans, domestic animals, and wildlife. Laboratory. (Sp)

BIOL 3083 Animal Behavior 3 Credit Hours
(Crosslisted with PSY 3083) Prerequisite: 2013 or permission of instructor. Animal behavior from an evolutionary perspective. The effects of natural selections on mechanisms underlying behavior and on diversity of behavior among and within species. (F, Sp)

BIOL 3092 Animal Behavior Laboratory 2 Credit Hours
(Crosslisted with PSY 3092) Prerequisite: junior standing; concurrent or previous enrollment in 3083. Laboratory and field studies on the adaptive nature of animal behavior, illustrating basic principles of experimental design, data analysis, and scientific writing. Laboratory (F)

BIOL 3101 Principles of Physiology Lab 1 Credit Hour
Prerequisite: BIOL 3103 or concurrent enrollment. Provides students with an introduction to methods and procedures used in physiological research. Topics include data acquisition, analysis and basic statistics, effects of temperature on living systems, nervous system functions, muscle mechanics and physiology, and studies of metabolic rates. In addition to hands-on lab experience, library projects and research papers are used to introduce students to methods of scientific communication. (Sp)

BIOL 3103 Principles of Physiology 3 Credit Hours
Prerequisite: ZOO/BIOL 1124, or ZOO/BIOL 1114 and ZOO/BIOL 1121; and Biology 1134, or permission of instructor. One semester of physics and organic chemistry strongly recommended. Introduction to basic concepts of physiology; relation of functions of organisms to physical and chemical principles, and to the environment; discussion of experimental design, constituents of tissues, energy, growth, homeostasis, cellular and organ functions. (F, Sp)

BIOL 3113 Cell Biology 3 Credit Hours
(Crosslisted with PBIO and MBIO 3113) Prerequisite: 1114, or 1124, or Biology 1134, or Botany 1114, and Chemistry 3053. Introduction to the cell as a unit of life. A chemical and physical comparison of procaryotic and eucaryotic cells to include a discussion of cell metabolism, types of metabolic regulation, and an analysis of ultrastructure. Emphasis will be placed on the dynamic changes in metabolism and ultrastructure which occur during the life of a cell. (F, Sp)

BIOL 3201 Animal Development Lab 1 Credit Hour
Prerequisite: 3203 or concurrent enrollment. Laboratory study of the development and embryology of a variety of animals. Developmental concepts and mechanisms will be illustrated through the use of prepared materials and hands-on experiments. Laboratory (F, Sp)

BIOL 3203 Animal Development 3 Credit Hours
Prerequisite: ZOO/BIOL 1124, or ZOO/BIOL 1114 and ZOO/BIOL 1121; and ZOO/BIOL 3333; and BIOL 1134. Study of animal development from gamete formation through organogenesis and postembryonic phases in different animal models. Concepts and mechanisms at the tissue, cellular and molecular levels will supplement descriptive analyses of development. (Sp)

BIOL 3214 Comparative Vertebrate Anatomy 4 Credit Hours
Prerequisite: BIOL 1114 and BIOL 1121; or BIOL 1124; or BIOL 1134; or equivalent. A study of the anatomy and evolutionary development of vertebrate organ systems. Representative vertebrates are studied in laboratory. Laboratory (F)

BIOL 3333 Genetics 3 Credit Hours
(Crosslisted with PBIO 3333) Prerequisite: ZOO/BIOL 1124, or ZOO/BIOL 1114 and ZOO/BIOL 1121; Biology 1134 recommended. Principles of inheritance at gene, chromosome, and population levels; nature of the genetic material and its involvement in the determination of structure and function. (F, Sp)

BIOL 3342 Genetics Laboratory 2 Credit Hours
(Crosslisted with PBIO 3342) Prerequisite: 3333 or concurrent enrollment, or equivalent. The demonstrations, crosses and experiments are designed to illustrate various genetic phenomena, including Mendelian laws, recombination, mutation, natural and artificial selection, and interaction of genotype with environment. The primary organism studied is Drosophila, with some use of corn, Neurospora, and others. Laboratory (F)

BIOL 3403 Principles of Ecology 3 Credit Hours
Prerequisite: BIOL 1114 and BIOL 1121, or BIOL 1134, or PBIO 1114. Patterns of environments and biological communities; the processes maintaining these patterns. Field trips. Some overnight trips. Laboratory (F, Sp)

BIOL 3440 Mentored Research Experience 3 Credit Hours
0 to 3 hours. Prerequisites: ENGL 1113 or equivalent, and permission of instructor. May be repeated; maximum credit 12 hours. For the inquisitive student to apply the scholarly processes of the discipline to a research or creative project under the mentorship of a faculty member. Student and instructor should complete an Undergraduate Research & Creative Projects (URCP) Mentoring Agreement and file it with the URCP office. Not for honors credit. (F, Sp, Su)

BIOL 3463 Water and Ecological Sustainability 3 Credit Hours
(Crosslisted with ENST 3463) Prerequisite: junior standing and English 1213 or Expository Writing 1213, BIOL 1114 or BIOL 1124 or BIOL 1134, or permission of instructor. Objective of the course is to allow students to examine and discuss important historical and current issues relating to the interactions between socio-economic use of water resources and ecosystem biodiversity, function, and sustainability. (F) [II-NL].

BIOL 3483 Remote Sensing and Phenology 3 Credit Hours
(Crosslisted with GEOG 3483) Prerequisite: junior standing. Focus on the analysis of phenology both on the ground and from space. Phenology is the study of the timing of biological phenomena, with a particular emphasis on the linkages between abiotic drivers and biological responses of particular organisms. Land surface phenology explores how quasi-periodic events in terrestrial vegetation appear when observed with satellite images. The course has a field component and the students will be trained as phenological observers. Field trips. (Sp)

BIOL 3563 Biological Conservation 3 Credit Hours
Prerequisite: BIOL 1114 and BIOL 1121, or BIOL 1134, or BOT/PBIO 1114. Active learning format course for exploring ecological, legal, and societal issues affecting biodiversity at local, regional, and global scales. (F-even numbered years)

BIOL 3833 Introduction to Neurobiology 3 Credit Hours
Prerequisite: BIOL 1124. Introduction to cellular and behavioral neurobiology. Topics covered will include cellular neurobiology, neurophysiology, neuroanatomy, sensory processing, movement, and neurobiology of behavior. (Sp)

BIOL 3960 Honors Reading (HONORS) 1-3 Credit Hours
1 to 3 hours. Prerequisite: admission to Honors Program. May be repeated; maximum credit six hours. Will consist of topics designated by the instructor. The content will emphasize work not presented in other courses. (F, Sp, Su)

BIOL 3970 Honors Seminar 1-3 Credit Hours
1 to 3 hours. Prerequisite: admission to Honors Program. May be repeated; maximum credit six hours. Discussion of recent and current research trends and significant developments in zoology. (Irreg.)

BIOL 3980 Honors Research (HONORS) 1-3 Credit Hours
1 to 3 hours. Prerequisite: admission to Honors Program. May be repeated; maximum credit six hours. Will provide an opportunity for the gifted Honors candidate to work at a special project under the guidance of a professor in the student's field. Laboratory (F, Sp, Su)

BIOL 3990 Independent Study 1-3 Credit Hours
1 to 3 hours. Prerequisite: one course in general area to be studied; permission of instructor and department. May be repeated; maximum credit six hours. Contracted independent study for topic not currently offered in regularly scheduled courses. Independent study may include library and/or laboratory research and field projects. (F, Sp, Su)

BIOL 4013 Insect Ecology 3 Credit Hours
(Slashlisted with BIOL 5013) Prerequisite: two college science courses that include a laboratory, one of which should be in biological sciences or permission of UOBS Director. A study of insect biodiversity in southern Oklahoma with emphasis on classification, natural history, relationship of insects to their habitats, and methods of collection. Topics will include characteristics of the major insect orders and families, insect natural history, morphological and physiological adaptations, and behavior and plant-insect interactions. No student may earn credit for both 4013 and 5013. Laboratory. (Su)

BIOL 4023 Field Mammology 3 Credit Hours
(Slashlisted with BIOL 5023) Prerequisite: two college science courses that include a laboratory, one of which should be in biological sciences or permission of UOBS Director. Study of mammals with emphasis on principle of mammalian ecology, conservation, biodiversity, techniques of field study, and methods of collection and preservation. Topics include characteristics of mammals, classification, natural history, ecology, biodiversity, conservation, and techniques in field study. Emphasis is given to mammals of southern Oklahoma and northern Texas. No student may earn credit for both 4023 and 5023. Laboratory. (Su)

BIOL G4034 Mammalogy 4 Credit Hours
Prerequisite: ZOO/BIOL 1124, or ZOO/BIOL 1114 and ZOO/BIOL 1121; and Biology 1134. Classification, distribution and natural history of mammals with emphasis on Oklahoma species. Mammals are collected and prepared for scientific collections. Field trips. Some overnight camping. Laboratory. (F even-numbered years)

BIOL G4044 Ornithology 4 Credit Hours
Prerequisite: ZOO/BIOL 1124, or ZOO/BIOL 1114 and 1121; and BIOL 1134. Biology of birds. Identification of birds in North America with emphasis on Oklahoma; relationships, natural history and behavior or birds. Field trips. Laboratory (Sp odd-numbered years)

BIOL 4053 Forensic Entomology 3 Credit Hours
Prerequisite: ZOO/BIOL 1124, or ZOO/BIOL 1114 and ZOO/BIOL 1121; and Biology 1134. Lecture will explore the use of insects in the science of forensic entomology and its impact on death scene investigation, neglect or abuse; contamination of food products and other marketable goods and subsequent litigation. Lab will be centered on a "death scene investigation" in which students will collect data from a pig carcass to determine factors that affect the rate of decomposition. Laboratory (May Intersession)

BIOL 4063 Field Herpetology 3 Credit Hours
(Slashlisted with BIOL 5063) Prerequisite: two college science courses that include a laboratory, one of which should be in biological sciences or permission of UOBS Director. Overview of methods, techniques, and standards for the collection, management, and analysis of herpetological field data for various applications. Includes collection of amphibians and reptiles, and diagnostic (morphological, ecological, and behavioral) characteristics of species. Students design and complete individual projects that address current issues in biology and conservation in herpetology. No student may earn credit for both 4063 and 5063. Laboratory. (Su)

BIOL G4073 General Entomology 3 Credit Hours
Prerequisite: Sophomore standing, and ZOO/BIOL 1114 and ZOO/BIOL 1121, or Biology 1134, or Botany/PBIO 1114, or Biology 1005, or permission of instructor. Introduction to the world of insects. Morphological and physiological adaptations; taxonomy, life histories, and methods of collection. Field trips. Laboratory (F)

BIOL G4083 Herpetology 3 Credit Hours
Prerequisite: 2013 and Biology 1134 or permission of instructor. An introduction to the study of amphibians and reptiles. Taxonomy, ecology, behavior and life histories of amphibians and reptiles, with emphasis on local forms. Field trips. Laboratory (F odd-numbered years)

BIOL G4093 Behavioral Ecology 3 Credit Hours
Prerequisite: 3083 or permission of instructor. Ecological basis of animal behavior and the role of behavior in adaptation, speciation, and co-evolution. Topics include behavioral genetics, decision making, sexual selection and sexual conflict, sociality, and human behavior and ecology. (F)

BIOL 4113 Cellular Pathology 3 Credit Hours
(Slashlisted with 5113) Prerequisite: 3113 or permission of instructor. The course focus is on the molecular and cellular bases of disease and alterations in cellular processes that lead to the development of various pathological conditions. Topics include symptoms of cellular disease, pathology of organelles, cell injury, cell death, immunopathology, neoplasia and genetic disorders. No student may earn credit for both 4113 and 5113. (F)

BIOL 4172 Cellular-Molecular Techniques 2 Credit Hours
Prerequisite: ZOO/BIOL 3113 or permission of instructor. A hands-on introduction to molecular techniques used in modern cell/molecular laboratories and discussed in cell biology courses. No student may earn credit for both ZOO/BIOL 4172 and ZOO/BIOL 5172. (Sp)

BIOL 4193 Life History 3 Credit Hours
(Slashlisted with 5193) Prerequisite: senior standing or permission of instructor. Overview of theory and empirical studies of life history evolution. Includes lecture, discussion of the primary literature, and analysis of some basic life history problems. No student may earn credit for both ZOO/BIOL 4193 and 5193. (Sp Odd-numbered years)

BIOL 4204 Vertebrate Paleobiology 4 Credit Hours
(Slashlisted with BIOL 5204; Crosslisted with GEOL 4204) Prerequisite: BIOL 1114 and 1121, or 1124 or 1134; BIOL 3214; or permission of instructor. Systematics, relationships, zoogeography and evolutionary morphology of the major groups of vertebrates. Field trips. Laboratory. No student may earn credit for both 4204 and 5204. (Sp)

BIOL 4233 Neurobiology of Disease 3 Credit Hours
Prerequisite: ZOO/BIOL 4833 (preferred), or ZOO/BIOL 3113 and ZOO/BIOL 3333, or ZOO/BIOL 2124 or ZOO/BIOL 3103; or permission of the instructor. Cellular and molecular mechanisms underlying both normal neuronal function and neuronal disorders. Includes a review of basic concepts in neuroscience through traditional lectures, and reading and discussion of original research articles. Students are required to give oral presentations, write critiques and term papers, and present research posters. No student may earn credit for both ZOO/BIOL 4233 and ZOO/BIOL 5233. (F)

BIOL G4244 Animal Histology 4 Credit Hours
Prerequisite: ZOO/BIOL 3103 and ZOO/BIOL 3113, or permission of instructor. Structure and function of animal tissues with emphasis on the cellular basis of tissue and organ function. Laboratory emphasizes the identification of cells and tissues with the use of the light microscope. Laboratory (Sp)

BIOL 4353 Molecular Tech-Field Biology 3 Credit Hours
(Slashlisted with 5353) Prerequisite: 1114 and 1121, or 1124 and permission of instructor; 3333 or 3403 recommended. Selected protocols and data interpretation using molecular techniques to study protein and DNA variation in natural populations and the application of molecular techniques to research problems in ecology, systematics, animal behavior, conservation biology, and related areas. Graduate students enrolled in 5353 will have additional project expectations and written work. Taught at the OU Biological Station. No student may earn credit for both 4353 and 5353. Field trips. Laboratory (Su)

BIOL 4361 Experimental Genetics and Cell Biology Lab 1 Credit Hour
Prerequisite: BIOL 3333 or BIOL 3113. Students will be introduced to experimental design and techniques including types of microscopy such as SEM and TEM, cell and tissue culture, DNA isolation, protein and DNA electrophoresis, PCR, and introductory bioinformatics. (Sp-odd numbered years)

BIOL 4394 Advanced Light Microscopy 4 Credit Hours
(Crosslisted with MBIO 4394 and PBIO 4394, Slashlisted with BIOL 5394) Prerequisite: permission of instructor and junior standing. Corequisite: Enrollment in lab section. Focuses on theory and techniques in light microscopy covering principles including confocal laser scanning microscopy, multiple photon imaging, FLIM/FCS, FRET, fluorescence microscopy, phase contrast, DIC, 3D rendering, and other advanced optical technologies. Also includes a lab section where students will learn to use advanced epifluorescence and confocal microscopes. No student may earn credit for both 4394 and 5394. (F)

BIOL G4413 Tropical Ecology 3 Credit Hours
Prerequisite: 3013 or 3083 or 3403. Focuses on unique features of tropical ecosystems. Topics include: abiotic features that give rise to tropical forests, gap dynamics, tropical biodiversity, plant-animal interactions, value of tropical forests, causes and consequences of tropical deforestation. (Irreg.)

BIOL 4423 Stream Ecology 3 Credit Hours
Prerequisite: ZOO/BIOL 1124, or ZOO/BIOL 1114 and ZOO/BIOL 1121; and Biology 1134; junior or senior standing, or permission of instructor. A combined lecture/laboratory course that focuses on the physical, chemical, and biological features of stream ecosystems, including current theories explaining species interactions and stream function. Course requirements/evaluation including a midterm and final examination, individual research papers and presentations, participation in group laboratory and field experiments, and reading and discussing the primary literature. No student may earn credit for both 4423 and 5423. Field trips. Laboratory (F-odd numbered years)

BIOL 4433 Freshwater Fish Ecology 3 Credit Hours
(Slashlisted with BIOL 5433) Prerequisite: Two college science courses that include a laboratory, one of which should be in biological sciences or permission of UOBS Director. Ecology of freshwater fish with emphasis on hands-on learning and study of fish in their natural settings. Topics include ecology of fish populations and communities, trophic structure and food webs, and field sampling and censusing techniques in streams and lakes. No student may earn credit for both 4433 and 5433. (Su)

BIOL G4463 Lake Ecology 3 Credit Hours
Prerequisite: CHEM 1315, PHYS 1205 or 2414, and BIOL 3403, or permission of instructor. An introduction to the biology, chemistry, physics, and geology of freshwater environments, with emphasis on ecology. (F)

BIOL G4471 Ecology of Lakes Laboratory 1 Credit Hour
Prerequisite: 4463 or concurrent enrollment. Experience in the use of the basic limnological methods and application of these methods to a variety of freshwater environments. Field trips. Laboratory (Sp, even-numbered years)

BIOL G4493 Ichthyology 3 Credit Hours
Prerequisite: BIOL 1124, or BIOL 1114 and BIOL 1121; and BIOL 1134. Taxonomy, morphology, ecology and distribution of fishes, with emphasis on those of the region. Field trips. Some overnight trips. Laboratory. (Sp)

BIOL 4553 Wetlands Ecology 3 Credit Hours
(Slashlisted with BIOL 5553) Prerequisite: Two college science courses that include a laboratory, one of which should be in biological sciences or permission of UOBS Director. Comprehensive field-based examination of wetland science and management. Biological, physical, chemical, and hydrological aspects of wetland ecosystem structure and function are explored through visits to several field sites. Major wetland types and resources are examined and the biogeochemical and ecological diversity of wetland waters, soils, vegetation, and fauna is investigated. No student may earn credit for both 4553 and 5553. Laboratory. (Su)

BIOL 4573 Conservation Genetics 3 Credit Hours
Prerequisite: 3333 or permission of the instructor. This lecture/discussion course will examine the use of population genetic/ecological genetic principles in the study and management of populations of threatened and/or endangered species. No student may earn credit for both 4573 and 5573. (Sp)

BIOL 4583 Field Studies in Biological Conservation 3 Credit Hours
Prerequisite: Two college science courses that include a laboratory, one of which should be in biological sciences, or permission of director. Introduce students to complex conservation issues with selected readings and field trips. A large portion of time will be spent outdoors, seeing Oklahoma's diverse ecoregions and associated conservation issues. Taught at the OU Biological Station. (Su)

BIOL G4653 Parasitology 3 Credit Hours
Prerequisite: BIOL 1124, or BIOL 1114 and BIOL 1121; and BIOL 1134. Parasitology is an introduction to the biological relationships known as parasitism. Although there are many different types of parasites, this course will focus on primarily protozoan and helminthes parasites that cause disease in humans and domestic animals. Field trips. Laboratory (Sp odd-numbered years)

BIOL 4663 Advanced Limnology 3 Credit Hours
Prerequisite: 4423 or 5423, or 4463 and 4471, or permission of instructor. May be repeated with change of content; maximum credit 6 hours. Detailed study of fundamental or contemporary topics within limnology, such as biogeochemistry, nutrient cycling, ecological stoichiometry, biodiversity, and predatory-prey and food-web dynamics in aquatic communities. No student may earn credit for both 4663 and 5663 on the same topic. (Sp)

BIOL 4753 Molecular Evolution and Phylogenetics 3 Credit Hours
(Slashlisted with BIOL 5753) Prerequisite: BIOL 2013 or BIOL 3333 or permission of instructor. Theory and practice of inferring evolutionary history from molecular and morphological data. Applications of the phylogenetic approach in systematics, comparative biology, molecular evolution, and genomics will be covered. No student may earn credit for both 4753 and 5753. (F even-numbered years)

BIOL 4813 Hormones and Behavior 3 Credit Hours
(Slashlisted with BIOL 5813) Prerequisite: 3083 or 3103 or permission of instructor. The relationship between hormones and behavior from an evolutionary perspective. Focus on reproductive and social behavior, with coverage of biological rhythms, food and water intake, and learning. No student may earn credit for both 4813 and 5813. (F)

BIOL 4833 Neurobiology 3 Credit Hours
(Slashlisted with BIOL 5833) Prerequisite: permission of instructor. Advanced examination of cellular and behavioral neurobiology. Topics covered will include membrane biophysics, cellular neurobiology, neurophysiology, neuroanatomy, sensory processing, movement, and neurobiology of behavior. No student may earn credit for both 4833 and 5833. (F)

BIOL 4843 Molecular Biology 3 Credit Hours
(Crosslisted with PBIO and MBIO 4843; Slashlisted with BIOL 5843) Prerequisite: BIOL 1114, or BIOL 1124, or BIOL 1134, or Plant Biology 1114, or Microbiology 3813 and Microbiology 3812, and one course in organic chemistry. Introduction to the characteristics and biological functions of nucleic acids and proteins in living cells with emphasis on nucleic acid replication, transcription, translation and regulation; also emphasis on the molecular aspects of microbial genetics transformation, transduction and conjugation; and emphasis on molecular immunology and genetic engineering/recombinant DNA technology. No student may earn credit for both 4843 and 5843. (F, Sp)

BIOL 4863 Neural Control of Movement 3 Credit Hours
(Slashlisted with BIOL 5863) Prerequisite: BIOL 3103, or BIOL 3113, or BIOL 3833, or BIOL 4833, or BIOL 5833, or permission of instructor. Introduction to neural control of movement through reading and discussion of key original research articles from the 19th century to the present. Students lead discussions and write essays addressing a general question, utilizing data from the articles; students in 5863 write an additional essay. Topics include localization of function, sensory vs. central contributions, roles of single neurons, effects of neuromodulators, and motor learning. No student may earn credit for both 4863 and 5863. (Sp)

BIOL 4871 Current Topics in Neurobiology 1 Credit Hour
(Slashlisted with BIOL 5871) Prerequisite: BIOL 3833 or permission of instructor. May be repeated with change of content; maximum credit three hours. A seminar course designed to develop a student's abilities to interpret and critically evaluate research in cellular and behavioral neurobiology. Involves both public seminars and journal club style discussions of contemporary literature. No student may earn credit for both 4871 and 5871 on the same topic. (F, Sp)

BIOL 4893 Behavioral Neurobiology 3 Credit Hours
(Slashlisted with BIOL 5893) Prerequisite: BIOL 3103, or BIOL 3113, or BIOL 3833, or BIOL 4833, or BIOL 5833, or permission of instructor. Examines neurobiological mechanisms of natural animal behaviors (i.e. neuroethology), utilizing textbook and lectures as well as in-depth reading, discussion, and student presentation of original research articles. No student may earn credit for both 4893 and 5893. (F)

BIOL G4913 Quantitative Biology 3 Credit Hours
Prerequisite: BIOL 1124, or BIOL 1114 and BIOL 1121; and BIOL 1134; Permission of instructor required. Techniques for complex data analysis and experimental design. (F)

BIOL 4933 Introduction to Matlab Programming for Life Sciences 3 Credit Hours
(Slashlisted with BIOL 5933) Prerequisite: permission of instructor. Introduce students to the foundational concepts and skills necessary to use Matlab programs for life science research. Topics include acquisition and processing of time-series and spatial data, experimental control, and visual display of data. No student may earn credit for 4933 and 5933. (Sp odd-numbered years)

BIOL 4943 Multivariate Analysis 3 Credit Hours
(Slashlisted with BIOL 5943) Prerequisite: BIOL 4913 or permission of instructor. An introduction to the concepts and underpinnings of multivariate statistics used commonly in the life sciences. It includes sections on regression, central tendency, data reduction, cluster analyses, and ordination and treats both parametric and non-parametric approaches. No student may earn credit for both 4943 and 5943. (Sp)

BIOL 4953 BioWriting 3 Credit Hours
(Slashlisted with BIOL 5953; Crosslisted with MBIO/PBIO 4953) Prerequisite: permission of instructor. This course provides students engaged in research with the information and skills needed to effectively communicate as professional biologists. Students will learn to report the results of their own research in the format of a journal article, conference-style presentation, and poster. No student may earn credit for 4953 and 5953 (Irreg.)

BIOL 4960 Directed Readings 1-4 Credit Hours
1 to 4 hours. Prerequisite: good standing in University; permission of instructor and dean. May be repeated; maximum credit four hours. Designed for upper-division students who need opportunity to study a specific problem in greater depth than formal course content permits. (Irreg.)

BIOL 4961 Undergraduate Seminar 1 Credit Hour
Prerequisite: Senior standing in Zoology/Biology or permission of department. May be repeated; maximum credit two hours. Survey of current research programs in environmental biology, cell biology, physiology, animal behavior and other fields presented in weekly public seminars by visiting and local experts in biology. (F, Sp)

BIOL 4970 Special Topics in Biology 3 Credit Hours
1 to 3 hours. Prerequisite: permission of instructor and department. May be repeated with change of content; maximum credit nine hours. Seminar or special topic course; may include laboratory or field work. No student may earn credit for 4970 and 5970 on the same topic. (F, Sp, Su)

BIOL 4983 Senior Seminar 3 Credit Hours
Prerequisite: ZOO/BIOL major with senior standing, or permission. An interdisciplinary approach will be used to synthesize ideas from the major fields of zoology. Readings and discussion will focus on contemporary social, ethical and economic issues. (F, Sp) [V].

BIOL 4990 Independent Study 1-3 Credit Hours
1 to 3 hours. Prerequisite: three courses in general area to be studied; permission of instructor and department. May be repeated; maximum credit six hours. Contracted independent study for topic not currently offered in regularly scheduled courses. Independent study may include library and/or laboratory research and field projects. (F, Sp, Su)

BIOL 5013 Insect Ecology 3 Credit Hours
(Slashlisted with BIOL 4013) Prerequisite: graduate standing and two college science courses that include a laboratory, one of which should be in biological sciences or permission of UOBS Director. A study of insect biodiversity in southern Oklahoma with emphasis on classification, natural history, relationship of insects to their habitats, and methods of collection. Topics will include characteristics of the major insect orders and families, insect natural history, morphological and physiological adaptations, and behavior and plant-insect interactions. No student may earn credit for both 4013 and 5013. Laboratory. (Su)

BIOL 5023 Field Mammalogy 3 Credit Hours
(Slashlisted with BIOL 4023) Prerequisite: graduate standing and two college science courses that include a laboratory, one of which should be in biological sciences or permission of UOBS Director. Study of mammals with emphasis on principle of mammalian ecology, conservation, biodiversity, techniques of field study, and methods of collection and preservation. Topics include characteristics of mammals, classification, natural history, ecology, biodiversity, conservation, and techniques in field study. Emphasis is given to mammals of southern Oklahoma and northern Texas. No student may earn credit for both 4023 and 5023. Laboratory. (Su)

BIOL 5063 Field Herpetology 3 Credit Hours
(Slashlisted with BIOL 4063) Prerequisite: graduate standing and two college science courses that include a laboratory, one of which should be in biological sciences or permission of UOBS Director. Overview of methods, techniques, and standards for the collection, management, and analysis of herpetological field data for various applications. Includes collection of amphibians and reptiles, and diagnostic (morphological, ecological, and behavioral) characteristics of species. Students design and complete individual projects that address current issues in biology and conservation in herpetology. No student may earn credit for both 4063 and 5063. Laboratory. (Su)

BIOL 5093 Evolutionary Ecology 3 Credit Hours
Prerequisite: graduate standing, or ZOO/BIOL 2013 or permission of instructor. Study of ecological forces important in evolutionary change in plants and animals. Evolution of sex, breeding systems, life history, speciation, coevolution of animal/plant interactions. (F even-numbered years)

BIOL 5113 Cellular Pathology 3 Credit Hours
(Slashlisted with 4113) Prerequisite: 3113 or permission of instructor. The course focus is on the molecular and cellular bases of disease and alterations in cellular process that lead to the development of various pathological conditions. Topics include symptoms of cellular disease, pathology of organelles, cell injury, cell death, immunopathology, neoplasia and genetic disorders. No student may earn credit for both 4113 and 5113. (F)

BIOL 5172 Cellular-Molecular Techniques 2 Credit Hours
Prerequisite: ZOO/BIOL 3113 or graduate standing or permission of instructor. A hands-on introduction to molecular techniques used in modern cell/molecular laboratories and discussed in cell biology courses. No student may earn credit for both 4172 and 5172. (Sp)

BIOL 5193 Life History 3 Credit Hours
Prerequisite: graduate standing or permission of instructor. Overview of theory and empirical studies of life history evolution. Includes lecture, discussion of the primary literature, and analysis of some basic life history problems. No student may earn credit for both 4193 and 5193. (Sp, Odd-numbered years)

BIOL 5204 Vertebrate Paleobiology 4 Credit Hours
(Slashlisted with BIOL 4204; Crosslisted with GEOL 5204) Prerequisite: graduate standing and permission of instructor. Systematics, relationships, zoogeography and evolutionary morphology of the major groups of vertebrates. Field trips. Laboratory. No student may earn credit for both 4204 and 5204. (Sp)

BIOL 5233 Neurobiology of Disease 3 Credit Hours
Prerequisite: ZOO/BIOL 4833 (preferred), or ZOO/BIOL 3113 and ZOO/BIOL 3333, or ZOO/BIOL 2124 or ZOO/BIOL 3103; or permission of the instructor. Cellular and molecular mechanisms underlying both normal neuronal function and neuronal disorders. Includes a review of basic concepts in neuroscience through traditional lectures, and reading and discussion of original research articles. Students are required to give oral presentations, write critiques and term papers, and present research posters. No student may earn credit for both 4233 and 5233. (F)

BIOL 5333 Ecological Genetics 3 Credit Hours
Prerequisite: 3333 required; 3013 recommended. History of population and ecological genetics; genetic systems; emphasis on experimental aspects of population genetics and measurement of selection and levels of genetic variation in different ecological situations; development of quantitative characters; genetic load; drift; enzyme variation; chromosome variation. (Irreg.)

BIOL 5343 Developmental Genetics 3 Credit Hours
Prerequisite: 3333. Covers the regulatory control of development in simple viral and bacterial operons, but emphasizes eukaryotic development and genetic organization. Topics will include DNA and chromosome structure, intron processing, nuclear-cytoplasmic interaction, pattern formation and aging. (Sp)

BIOL 5353 Molecular Tech-Field Biology 3 Credit Hours
(Slashlisted with 4353) Prerequisite: permission of instructor. Selected protocols and data interpretation using molecular techniques to study protein and DNA variation in natural populations and the application of molecular techniques to research problems in ecology, systematics, animal behavior, conservation biology, and related areas. Graduate students enrolled in 5353 will have additional project expectations and written work. Taught at the OU Biological Station. No student may earn credit for both 4353 and 5353. Field trips. Laboratory (Su)

BIOL 5364 Transmissn Electron Microscopy 4 Credit Hours
(Crosslisted with PBIO and MBIO 5364) Prerequisite: permission of instructor. Introduction to the theory of transmission electron microscopy and practical instruction in specimen preparation, ultramicrotomy, instrument operation, photography and quantitative methods. Laboratory. (F)

BIOL 5374 Scanning Electron Microscopy 4 Credit Hours
(Crosslisted with PBIO and MBIO 5374) Prerequisite: basic chemistry; basic physics; demonstrated need; permission of instructor. Principles of scanning electron microscopy are combined with training in the operation of the SEM and ancillary equipment. Students will be certified in the operation of all equipment. Sample preparationon a variety of samples and darkroom procedures will be performed. Independent project with oral report and poster required. Laboratory (Irreg.)

BIOL 5394 Advanced Light Microscopy 4 Credit Hours
(Crosslisted with MBIO 5394 and PBIO 5394, Slashlisted with BIOL 4394) Prerequisite: permission of instructor and graduate standing. Focuses on theory and techniques in light microscopy covering principles including confocal laser scanning microscopy, multiple photon imaging, FLIM/FCS, FRET, fluorescence microscopy, phase contrast, DIC, 3D rendering, and other advanced optical technologies. Also includes a lab section where students will learn to use advanced epifluorescence and confocal microscopes. No student may earn credit for both 4394 and 5394. (F)

BIOL 5403 Population Ecology 3 Credit Hours
Prerequisite: graduate standing. History, demography, environmental factors, density-dependent factors, genetics and population ecology, theories of population and community organization (ideas of Elton, Williams, Preston, MacArthur, Smith, Hairston, and Slodbodkin). No laboratory. (Sp even-numbered years)

BIOL 5413 Community Ecology 3 Credit Hours
Prerequisite: 3403 and Mathematics 1743 or 1823, or permission. Theoretical and empirical study of the structure and organization of natural communities. Topics include competition, predation, disturbance, abiotic gradients, species equilibria.

BIOL 5423 Stream Ecology 3 Credit Hours
Prerequisite: graduate standing or permission of instructor. A combined lecture/laboratory course that focuses on the physical, chemical, and biological features of stream ecosystems, including current theories explaining species interactions and stream function. Course requirements/evaluation including a midterm and final examination, individual research papers and presentations, participation in group laboratory and field experiments, and reading and discussing the primary literature. No student may earn credit for both 4423 and 5423. Field trips. Laboratory. (F-odd numbered years)

BIOL 5433 Freshwater Fish Ecology 3 Credit Hours
(Slashlisted with BIOL 4433) Prerequisite: Two college science courses that include a laboratory, one of which should be in biological sciences or permission of UOBS Director. Ecology of freshwater fish with emphasis on hands-on learning and study of fish in their natural settings. Topics include ecology of fish populations and communities, trophic structure and food webs, and field sampling and censusing techniques in streams and lakes. No student may earn credit for both 4433 and 5433. (Su)

BIOL 5443 Physiological Ecology 3 Credit Hours
Prerequisite: 12 hours of biology, including a course in physiology and in ecology, or permission. A study of the physiological adjustments made by animals to changes in their external environment. (Sp)

BIOL 5453 Advanced Ecology/Evol Biology 3 Credit Hours
(Crosslisted with PBIO and MBIO 5453) Prerequisite: ZOO/BIOL 3403. Required for students in the ecology and evolutionary biology doctoral program. An introduction to current research opportunities and research programs in ecology and evolutionary biology at the University of Oklahoma. Specific topics and lecturers will vary from week to week to give students a broad overview of ongoing research projects. (F)

BIOL 5462 Molecular Methods in Ecology and Evolution 2 Credit Hours
Prerequisite: graduate standing and permission of instructor. Laboratory-based course designed to develop skills commonly used in molecular population genetics, ecology and systematics. Emphasis will be on DNA-based methods such as PCR, DNA sequencing, and microsatellite DNA procedures. Theoretical, physical and biochemical bases of methods will be stressed. Appropriate applications of methods and basic data analysis will also be covered. Laboratory (F - even years)

BIOL 5471 Seminar-Ecology & Evol Biology 1 Credit Hour
(Crosslisted with PBIO and MBIO 5471) Prerequisite: graduate standing. Two semesters of enrollment are required for students in the ecology and evolutionary biology doctoral program. An intensive, student-based seminar in which students present both proposals and ongoing progress reports on doctoral level research projects in ecology and evolutionary biology. (F, Sp)

BIOL 5553 Wetlands Ecology 3 Credit Hours
(Slashlisted with BIOL 4553) Prerequisite: graduate standing and two college science courses that include a laboratory, one of which should be in biological sciences or permission of UOBS Director. Comprehensive field-based examination of wetland science and management. Biological, physical, chemical, and hydrological aspects of wetland ecosystem structure and function are explored through visits to several field sites. Major wetland types and resources are examined and the biogeochemical and ecological diversity of wetland waters, soils, vegetation, and fauna is investigated. No student may earn credit for both 4553 and 5553. Laboratory. (Su)

BIOL 5563 Biological Conservation 3 Credit Hours
(Slashlisted with 4563) Prerequisite: permission of instructor. The human economy currently entrains more than 40% of global net primary production. This human demand for energy and the effluent subsequently produced have pervasive effects on natural systems and human welfare. This course uses primary literature to guide discussion of ecological, legal, and societal issues affecting biodiversity in North America and globally. Topics range from organism centered approaches to conservation to broader implications of alterations of global processes such as elemental cycles and atmospheric temperatures. No student may earn credit for both 4563 and 5563. (F-even numbered years)

BIOL 5573 Conservation Genetics 3 Credit Hours
Prerequisite: 3333 or permission of the instructor. This lecture/discussion course will examine the use of population genetic/ecological genetic principles in the study and management of populations of threatened and/or endangered species. No student may earn credit for both 4573 and 5573. (Sp)

BIOL 5663 Advanced Limnology 3 Credit Hours
Prerequisite: 4423 or 5423, or 4463 and 4471, or permission of instructor. May be repeated with change of content; maximum credit 6 hours. Detailed study of fundamental or contemporary topics within limnology, such as biogeochemistry, nutrient cycling, ecological stoichiometry, biodiversity, and predator-prey and food-web dynamics in aquatic communities. No student may earn credit for both 4663 and 5663 on the same topic. (Sp)

BIOL 5753 Molecular Evolution and Phylogenetics 3 Credit Hours
(Slashlisted with BIOL 4753) Prerequisite: BIOL 2013 or BIOL 3333 or permission of instructor and graduate standing. Theory and practice of inferring evolutionary history from molecular and morphological data. Applications of the phylogenetic approach in systematics, comparative biology, molecular evolution, and genomics will be covered. No student may earn credit for both 4753 and 5753. (F - even-numbered years)

BIOL 5813 Hormones and Behavior 3 Credit Hours
(Slashlisted with BIOL 4813) Prerequisite: 3083 or 3103 or permission of instructor. The relationship between hormones and behavior from an evolutionary perspective. Focus on reproductive and social behavior, with coverage of biological rhythms, food and water intake, and learning. No student may earn credit for both 4813 and 5813. (F)

BIOL 5833 Neurobiology 3 Credit Hours
(Slashlisted with BIOL 4833) Prerequisite: graduate standing or permission of instructor. Advanced examination of cellular and behavioral neurobiology. Topics covered will include membrane biophysics, cellular neurobiology, neurophysiology, neuroanatomy, sensory processing, movement, and neurobiology of behavior. No student may earn credit for both 4833 and 5833. (F)

BIOL 5843 Molecular Biology 3 Credit Hours
(Crosslisted with PBIO and MBIO 5843; Slashlisted with BIOL 4843) Prerequisite: graduate standing or permission of instructor. Introduction to the characteristics and biological functions of nucleic acids and proteins in living cells with emphasis on nucleic acid replication, transcription, translation and regulation; also emphasis on the molecular aspects of microbial genetics transformation, transduction and conjugation; and emphasis on molecular immunology and genetic engineering/recombinant DNA technology. No student may earn credit for both 4843 and 5843. (F, Sp)

BIOL 5863 Neural Control of Movement 3 Credit Hours
(Slashlisted with BIOL 4863) Prerequisite: ZOO/BIOL 3103 or ZOO/BIOL 3113 or ZOO/BIOL 4833/5833 or permission of instructor. Introduction to neural control of movement through reading and discussion of key original research articles from the 19th century to the present. Students lead discussions and write essays addressing a general question, utilizing data from the articles; students in 5863 write an additional essay. Topics include localization of function, sensory vs. central contributions, roles of single neurons, effects of neuromodulators, and motor learning. No student may earn credit for both 4853 and 5863. (Sp)

BIOL 5871 Current Topics in Neurobiology 1 Credit Hour
(Slashlisted with BIOL 4871) Prerequisite: Permission of the instructor. May be repeated; maximum credit three hours. A seminar course designed to develop a student's abilities to interpret and critically evaluate research in cellular and behavioral neurobiology. Involves both public seminars and journal club style discussions of contemporary literature. No student may earn credit for both 4871 and 5871 concurrently. (F, Sp)

BIOL 5893 Behavioral Neurobiology 3 Credit Hours
(Slashlisted with BIOL 4893) Prerequisite: ZOO/BIOL 3103 or ZOO/BIOL 3113, or ZOO/BIOL 4833/5833 or permission of instructor. Examines neurobiological mechanisms of natural animal behaviors (i.e., neuroethology), utilizing textbook and lectures as well as in-depth reading, discussion, and student presentation of original research articles. No student may earn credit for both 4893 and 5893. (F)

BIOL 5923 Programming in R for Biology 3 Credit Hours
Prerequisite: graduate standing or permission of instructor. R is a data analysis and graphics platform that has become increasingly popular in the sciences because of its power and versatility. This course provides an introduction to programming using R for applications in the biological sciences, with an emphasis on implementation. (F)

BIOL 5933 Introduction to Matlab Programming for Life Sciences 3 Credit Hours
(Slashlisted with BIOL 4933) Prerequisite: graduate standing or permission of instructor. Introduces the foundational concepts and skills necessary to use Matlab programs for life science research. Topics include acquisition and processing of time-series and spatial data, experimental control, and visual display of data. No student may earn credit for both 4933 and 5933. (Sp odd-numbered years)

BIOL 5943 Multivariate Analysis 3 Credit Hours
(Slashlisted with BIOL 4943) Prerequisite: BIOL 4913 or permission of instructor. Introduces the concepts and underpinnings of multivariate statistics used commonly in the life sciences. The following topics will be included: regression, central tendency, data reduction, cluster analyses, and ordination and treats both parametric and non-parametric approaches. No student may earn credit for both 4943 and 5943. (Sp)

BIOL 5953 BioWriting 3 Credit Hours
(Slashlisted with BIOL 4953; Crosslisted with MBIO/PBIO 5953) Prerequisite: permission of instructor. This course provides students engaged in research with the information and skills needed to effectively communicate as professional biologists. Students will learn to report the results of their own research in the format of a journal article, conference-style presentation, and poster. Graduate students have additional assignments beyond those completed by undergraduates. No student may earn credit for both 4953 and 5953. (Irreg.)

BIOL 5960 Directed Readings 1-3 Credit Hours
1 to 3 hours. Prerequisite: graduate standing and permission of department. May be repeated; maximum credit twelve hours. Directed readings and/or literature reviews under the direction of a faculty member. (F, Sp, Su)

BIOL 5970 Special Topics in Biology 3 Credit Hours
1 to 3 hours. Prerequisite: permission of instructor. May be repeated with change of topic; maximum credit 12 hours. Special topics course; may include laboratory or field work. No student may earn credit for 4970 and 5970 on the same topic. (F, Sp, Su)

BIOL 5980 Research for Master's Thesis 2-9 Credit Hours
Variable enrollment, two to nine hours; maximum credit applicable toward degree, six hours. Laboratory (F, Sp, Su)

BIOL 5990 Independent Study 1-6 Credit Hours
1 to 6 hours. Prerequisite: permission. May be repeated in different fields; maximum credit 12 hours. Directed readings. Written report required. No laboratory. (F, Sp, Su)

BIOL 6003 Ecological Modeling 3 Credit Hours
(Crosslisted with PBIO and MBIO 6003) Prerequisite: one computer course, one course in ecology, or permission of instructor. Trains students to use modeling tools in their research and to gain greater ability to understand, appreciate, and criticize modeling work. Students will learn general procedure and principles with case studies of successful models in ecology and participate in course projects to gain hands-on experience in model development. (Irreg.)

BIOL 6011 Professional Aspects of Biology 1 Credit Hour
Prerequisite: graduate standing in biological sciences or permission of instructor. May be repeated with change of content; maximum credit 3 hours. Seminar-style discussion of varied topics for professional development of biologists. Sample topics include scientific writing, the process of publication, writing research grant proposals, preparing effective presentations, and professional job placement. (Irreg.)

BIOL 6960 Directed Readings 1-3 Credit Hours
1 to 3 hours. Prerequisite: graduate standing or permission of instructor. May be repeated; maximum credit six hours. Directed readings and/or literature review under the direction of a faculty member. (Irreg.)

BIOL 6970 Seminar 1-4 Credit Hours
1 to 4 hours. Prerequisite: graduate standing and permission of instructor. May be repeated; maximum credit 12 hours; no more than six hours may be in any one field. No laboratory. (F, Sp, Su)

BIOL 6980 Research Doctoral Dissertation 2-16 Credit Hours
(F, Sp, Su)

BIOL 6990 Independent Study 1-3 Credit Hours
1 to 3 hours. Prerequisite: Graduate standing and permission of instructor. May be repeated; maximum credit nine hours. Contracted independent study for a topic not currently offered in regularly scheduled courses. Independent study may include library and/or laboratory research and field projects. (Irreg.)