

DEPARTMENT OF BIOLOGY

Supple Building Room 384
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www.bio.txstate.edu (<http://www.bio.txstate.edu>)

Biology is the study of living systems and how they function. Because the biological sciences have had and continue to have profound impact on questions of concern to human society - longevity, environmental quality, biotechnology - knowledge of the biological sciences is an important aspect of higher education.

Biologists find employment in research laboratories, regulatory agencies, and education. Interested students should see the major area advisors for more information.

Biology majors take a minimum of 11 courses that include the core curriculum of Functional Biology, Organismal Biology, Genetics, a biological diversity course, a physiology course, Ecology, and Evolution. At the sophomore level and above, a variety of courses in cellular and organismal biology assure a broad education in any of the regions of specialization. Additional required courses in chemistry, mathematics and physics provide the broad scientific background that is foundational to biological sciences. A minor outside the Biology Department is required for all areas of study except for the Wildlife Biology program. The B.S. major in Biology or in Microbiology is often the choice for those seeking pre-medical and pre-dental education as the courses required for graduation fulfill all the prerequisites required for admission to medical or dental school.

Teacher Certification

Students may earn the Life Science (Texas Grades 7-12) certification through a B.S. major in Biology. Initial or additional certification may also be acquired as a post-baccalaureate or graduate student. Students interested in certification are strongly encouraged to see the Science and Engineering Advisor early in their undergraduate program or certification process.

Bachelor of Science (B.S.)

- Major in Aquatic Biology (<http://mycatalog.txstate.edu/undergraduate/science-engineering/biology/aquatic-bs>)
- Major in Biology (<http://mycatalog.txstate.edu/undergraduate/science-engineering/biology/biology-bs>)
- Major in Biology (Pre-Dental Concentration) (<http://mycatalog.txstate.edu/undergraduate/science-engineering/biology/biology-predental-bs>)
- Major in Biology (Pre-Medical Concentration) (<http://mycatalog.txstate.edu/undergraduate/science-engineering/biology/biology-premedical-bs>)
- Major in Biology (Pre-Physician Assistant Concentration) (<http://mycatalog.txstate.edu/undergraduate/science-engineering/biology/biology-prephysicianasst-bs>)
- Major in Biology (Teacher Certification in Life Sciences, Grades 7-12) (<http://mycatalog.txstate.edu/undergraduate/science-engineering/biology/biology-teacher-certification-life-sciences-grades-7-12-bs>)
- Major in Microbiology (<http://mycatalog.txstate.edu/undergraduate/science-engineering/biology/microbiology-bs>)

- Major in Microbiology (Pre-Dental Concentration) (<http://mycatalog.txstate.edu/undergraduate/science-engineering/biology/microbiology-predental-bs>)
- Major in Microbiology (Pre-Medical Concentration) (<http://mycatalog.txstate.edu/undergraduate/science-engineering/biology/microbiology-premedical-bs>)
- Major in Microbiology (Pre-Physician Assistant Concentration) (<http://mycatalog.txstate.edu/undergraduate/science-engineering/biology/microbiology-prephysicianasst-bs>)
- Major in Wildlife Biology (<http://mycatalog.txstate.edu/undergraduate/science-engineering/biology/wildlife-certification-biologist-bs>)

Minors

- Biology (<http://mycatalog.txstate.edu/undergraduate/science-engineering/biology/biology-minor>)

Subjects in this department include: BIO (p. 1), GS (p. 11)

Courses in Biology (BIO)

BIO 1320 and BIO 1421 may be taken in any order. BIO 1320 and BIO 1421 will not meet the requirements for medical or dental schools.

BIO 1130. Functional Biology Laboratory.

Fundamental techniques and instruments used in cellular biological research will be taught while emphasizing safety, measurements, and scientific methods. Students will design and implement controlled experiments, identify independent and dependent variables, analyze data, draw conclusions, and communicate results with appropriate tables and graphs in oral presentations and written papers.

1 Credit Hour. 0 Lecture Contact Hours. 3 Lab Contact Hours.

Grade Mode: Standard Letter

TCCN: BIOL 1106

Course Fee: \$5; Fee - Lab BIO

BIO 1131. Organismal Biology Laboratory.

This course introduces the students to the basics of experimental design, scientific method and inquiry, use of statistical analyses and writing research papers. Topics covered include Mendelian and population genetics, natural selection, population ecology, phylogeny, and behavioral ecology.

1 Credit Hour. 0 Lecture Contact Hours. 3 Lab Contact Hours.

Grade Mode: Standard Letter

TCCN: BIOL 1107

Course Fee: \$5; Fee - Lab BIO

BIO 1320. Modern Biology I, Molecules, Cells, and Physiology.

Provides students with basic scientific and biological principles. Current problems in biology and the ethics of science are presented with perspectives of public policy from a scientific viewpoint. This course is not recommended for majors in the natural sciences, including biology.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Course Attribute(s): Life & Phys Sciences Core 030

Grade Mode: Standard Letter

TCCN: BIOL 1308

BIO 1321. Ecology, Evolution and Society.

This course provides the non-science major an overview of the ecological and evolutionary principles that govern relationships between living organisms, including humans, and their environment. Special attention is given to environmental issues of current concern, such as overpopulation, climate change, pollution, resource depletion, and conservation biology.

3 Credit Hours. 3 Lecture Contact Hours. 1 Lab Contact Hour.

Course Attribute(s): Life & Phys Sciences Core 030

Grade Mode: Standard Letter

BIO 1330. Functional Biology.

This course provides the students with a strong foundation in cellular and molecular biology. Topics include biochemistry, energy metabolism, molecular bases of gene regulation and protein functions, cell division and control, and cell signaling. This course is required for all biology majors and is not recommended for non-science majors.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Course Attribute(s): Life & Phys Sciences Core 030|Lab Required

Grade Mode: Standard Letter

TCCN: BIOL 1306

BIO 1331. Organismal Biology.

This course provides science majors with a foundation in organismal biology, Mendelian and population genetics, evolution and ecology.

Topic include: patterns of inheritance, genetics, evolution, speciation, phylogenetics, and behavioral population, community, and ecosystem ecology. This course is required for all biology majors and is not recommended for non-science majors.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Course Attribute(s): Life & Phys Sciences Core 030|Lab Required

Grade Mode: Standard Letter

TCCN: BIOL 1307

BIO 1421. Modern Biology II, Organisms, Evolution, and Environment.

This course provides the non-science major the strong and diverse background necessary to understand the structural and functional diversity of organisms, evolution and behavior, and interactions among organisms and their environment. Topics include issues such as the genetic basis of behavior, overpopulation and extinction, ozone depletion, and conservation biology. This course is not recommended for majors in the natural sciences, including biology.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Life & Phys Sciences Core 030|Lab Required

Grade Mode: Standard Letter

TCCN: BIOL 1409

Course Fee: \$5; Fee - Lab BIO

BIO 2400. Microbiology.

Principles of microbiology, morphology, anatomy, physiology and taxonomy of representative groups of non-pathogenic organisms. Laboratory methods stress studies of pure cultures, the use of laboratory apparatus in quantitative determinations and the detection and identification of microbial populations in the environment. Prerequisites: BIO 1330 and BIO 1130, and BIO 1331 and BIO 1131; and CHEM 1341 all with grades of "C" or higher.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

TCCN: BIOL 2421

Course Fee: \$5; Fee - Lab BIO

BIO 2410. Intermediate General Botany.

An introduction to the biology of plants and plant-like organisms, emphasizing their role in ecosystem processes, relationships between structure and function, and the evolutionary relationships among the major plant groups. Prerequisites: BIO 1330 and BIO 1130, and BIO 1331 and BIO 1131 with grades of "C" or higher.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

Course Fee: \$5; Fee - Lab BIO

BIO 2411. Intermediate Zoology.

Provides biology majors a strong foundation in animal biology at the organismal level. The format will include details of animal form and function as well as concepts relating to classification, phylogeny, evolution, and ecology. Topics will include natural history, biogeography, adaptations to local environments, shared characters, and behavior. All material is presented in an accepted phylogenetic sequence. Prerequisites: BIO 1330/BIO 1130, and BIO 1331/BIO 1131 all with grades of "C" or higher.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

Course Fee: \$5; Fee - Lab BIO

BIO 2430. Human Physiology and Anatomy.

A course on human physiology covering the various organ systems. Principles of molecular biology, cell and tissue structure, anatomy and relationship of structure and function are stressed. May not be credited toward a Biology major or minor.

4 Credit Hours. 3 Lecture Contact Hours. 4 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

TCCN: BIOL 2404

Course Fee: \$5; Fee - Lab BIO

BIO 2440. Principles of Microbiology.

The Basic Principles of microbiology, morphology, physiology, immunology and the relationship of microorganisms to diseases. This course is designed primarily to meet the requirements for students in allied health sciences and other programs requiring only one semester of microbiology. This course may not be credited toward a biology major or minor. Prerequisites: BIO 1330 and CHEM 1341 with minimum grades of D.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

TCCN: BIOL 2420

Course Fee: \$5; Fee - Lab BIO

BIO 2450. Genetics.

An introduction to basic principles of Genetics by studies of Mendelian, molecular, quantitative and population genetics. Topics include: classical transmission genetics, and gene mapping, DNA replication and repair, transcription, translation, control of gene expression, genetic engineering techniques, Hardy-Weinberg equilibrium, evolutionary change via natural selection, and genetic drift. Prerequisites: BIO 1330, BIO 1130, BIO 1331 and BIO 1131; CHEM 1141, CHEM 1341, CHEM 1142, and CHEM 1342 all with grades of "C" or higher.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

TCCN: BIOL 2416

Course Fee: \$20; Fee - Lab BIO

BIO 2451. Human Anatomy and Physiology I.

Part I of a two semester course on the structure and function of the human body. Designed specifically to prepare students for nursing and other health professions. Prerequisites: BIO 1330 and CHEM 1341, all with a grade of "C" or better.

4 Credit Hours. 3 Lecture Contact Hours. 2 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

TCCN: BIOL 2401

BIO 2452. Human Anatomy and Physiology II.

This course is the second part of a two semester course on the structure and function of the human body designed specifically to prepare students for nursing and other health professions. Prerequisites: BIO 1330 and CHEM 1341 and BIO 2451, all with a grade of "C" or better.

4 Credit Hours. 3 Lecture Contact Hours. 2 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

TCCN: BIOL 2402

BIO 3300. Cell and Molecular Biology.

Fundamentals of structure and function of prokaryotic and eukaryotic cells. Course includes cell and organelle structure, basic biochemistry, principles of thermodynamics and energy transformation, nucleic acid and protein synthesis, enzyme kinetics, cell motility and cell signaling. Prerequisites: BIO 1330, BIO 1130, BIO 2450, and CHEM 1342 with grades of "C" or higher, or permission of instructor.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Grade Mode: Standard Letter

BIO 3308. Global Ecology.

An interdisciplinary introduction to the science of global environmental change. Emphasis will be placed on understanding principles of earth system science, the scientific basis underlying the major components of global environmental change, the linkages between these components, and the central role of humanity in contributing to the observed changes. Prerequisites: BIO 1330, BIO 1130, BIO 1331 and BIO 1131 with grades of "C" or higher. (WI).

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Course Attribute(s): Writing Intensive

Grade Mode: Standard Letter

BIO 3341. Aquatic Toxicology.

This course examines the basic concepts of aquatic toxicology, including uptake mechanisms, interactions, and elimination of different toxicants. Students will understand how toxic substances impact freshwater and marine organisms and identify potential health impacts to humans. Topics to be discussed include nutrients, metals, oil, pesticides, radionuclides, plastics, and emerging contaminants. Prerequisite: BIO 1331 and CHEM 1341, all with a grade of "C" or better.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Grade Mode: Standard Letter

BIO 3351. Forensic and Human Genetics.

This course introduces students to basic principles of Mendelian, molecular, and forensic genetics as it relates to the problems of human populations. This course is intended for non-science majors. May not be credited towards a biology major or minor. Prerequisites: BIO 1320 and BIO 1421, or BIO 1330/BIO 1130 and BIO 1331/BIO 1131.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Grade Mode: Standard Letter

BIO 3371. Marine Resources.

This course examines the exploitation and fragility of the marine environment and the economic importance of marine resources. Topics to be examined include ocean ownership, overfishing, aquaculture, shark finning, whaling, ocean mining, marine transportation, tourism, pollution, harvesting energy from the ocean, and the importance of creating marine reserves. Prerequisite: BIO 1331 with a grade of "C" or better.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Grade Mode: Standard Letter

BIO 3406. Economic Botany.

An introduction to the utilization of plants by humans and their economic and ecological significance. Laboratories will stress plant features beneficial to economic and societal needs. Prerequisite: BIO 2450 with a grade of "C" or better.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

Course Fee: \$5; Fee - Lab BIO

BIO 3410. Phycology.

A study of algal organisms, comparative and culture techniques. Prerequisites: 8 hours from BIO 1410 or BIO 2410 or BIO 2450 or BIO 3400 or BIO 3450, with a grade of "C" or better.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

Course Fee: \$5; Fee - Lab BIO

BIO 3421. Vertebrate Physiology.

The study of the physiology of vertebrate organ systems, including the nervous system, musculoskeletal system, endocrine system, cardiovascular system, respiratory system, digestive system, reproductive system and urinary system. Mammalian systems will be emphasized. Prerequisites: BIO 2450 with a grade of "C" or better.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

Course Fee: \$5; Fee - Lab BIO

BIO 3430. Mycology.

A study of the fungal kingdom including slime molds and lichens. Laboratory studies will emphasize taxonomy, morphology and culture techniques. Prerequisites: BIO 2410 or BIO 2400 and BIO 2450, with a grade of "C" or better.

4 Credit Hours. 3 Lecture Contact Hours. 2 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

BIO 3442. Virology.

The structure, multiplication and genetics of bacterial, plant, and animal viruses. The role of viruses in human and plant disease. Prerequisites: BIO 2400 and BIO 2450 with a grade of "C" or better. (WI).

4 Credit Hours. 3 Lecture Contact Hours. 4 Lab Contact Hours.

Course Attribute(s): Lab Required|Writing Intensive

Grade Mode: Standard Letter

Course Fee: \$20; Fee - Lab BIO

BIO 3460. Aquatic Biology.

An introduction to plant and animal life in the fresh water habitats of the local area. Prerequisites: BIO 2411 and BIO 2450 with a grade of "C" or better; and one year of Chemistry. (WI).

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required|Writing Intensive

Grade Mode: Standard Letter

Course Fee: \$5; Fee - Lab BIO

BIO 3461. Plant Taxonomy.

Principles of identification and classification of plants; nomenclature and characteristics of various plant groups with emphasis on the higher plants. Prerequisites: BIO 2450 with a grade of "C" or better.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

Course Fee: \$20; Fee - Lab BIO

BIO 3465. Plant Physiology.

Basic principles of plant physiology studied in lecture and laboratory. Prerequisite: BIO 2450 with a grade of "C" or better or consent of instructor. One semester of organic chemistry is strongly recommended.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

Course Fee: \$5; Fee - Lab BIO

BIO 3470. Invertebrate Zoology.

A study of the comparative morphology, evolution, systematics and natural history of invertebrates. Prerequisites: BIO 2411 and BIO 2450 with a grade of "C" or better.

4 Credit Hours. 3 Lecture Contact Hours. 4 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

Course Fee: \$20; Fee - Lab BIO

BIO 3480. Histology.

A study of the structural and functional relationships between cells and tissues in organs. The laboratory includes the study of prepared slides and of microtechnique. This course is designed to meet the needs of pre-professional students. Prerequisite: BIO 2450 with a grade of "C" or better.

4 Credit Hours. 3 Lecture Contact Hours. 4 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

Course Fee: \$20; Fee - Lab BIO

BIO 3490. Principles of Developmental Biology.

This course will cover basic principles of developmental biology in both plant and animal systems. Course will mainly address cell, molecular and genetic mechanisms underlying the development of model organisms.

Prerequisites: BIO 1430 and BIO 2450.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

Course Fee: \$5; Fee - Lab BIO

BIO 4126. Immunology Laboratory.

This laboratory-based course will cover cells of the immune system and basic serological reactions, including bacterial and viral agglutination reactions, precipitation, immunoelectrophoresis, immunofluorescence, and enzyme-linked immunosorbent assays. Prerequisites: BIO 2400 and BIO 2450 with grades of "C" or better. Pre- or co-requisite: BIO 4326.

1 Credit Hour. 0 Lecture Contact Hours. 3 Lab Contact Hours.

Grade Mode: Standard Letter

Course Fee: \$5; Fee - Lab BIO

BIO 4166. Medical Microbiology Laboratory.

This laboratory-based course will cover pathogenic bacteria emphasizing identification of selected groups of pathogens and the biological basis for virulence. Prerequisites: BIO 2400 and BIO 2450, with grades of C or higher. Corequisite: BIO 4345. (WI).

1 Credit Hour. 0 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Writing Intensive

Grade Mode: Standard Letter

BIO 4176. Microbial Biotechnology Laboratory.

This laboratory-based course will cover use of microbes for biotechnological applications and is designed to provide practical explorations into fields of biotechnology. Topics include laboratory techniques for recombinant protein purification, fermentation, identification of markers in genetically modified food and bioremediation of pollutants. Prerequisite: BIO 2400 and BIO 2450 with grades of "C" or higher. Corequisite: BIO 4376.

1 Credit Hour. 0 Lecture Contact Hours. 3 Lab Contact Hours.

Grade Mode: Standard Letter

BIO 4299. Undergraduate Research.

Supervised individual research projects in a mentor-student relationship with a biology professor. Available only to biology majors with junior standing and at least a "B" average. May be repeated once for credit. Prerequisites: BIO 2450 with a grade of "C" or better and consent of the supervising professor.

2 Credit Hours. 0 Lecture Contact Hours. 4 Lab Contact Hours.

Course Attribute(s): Exclude from 3-peat Processing

Grade Mode: Standard Letter

Course Fee: \$20; Fee - Lab BIO

BIO 4300. Neurobiology.

This course will give students an overview of neuroscience, particularly the areas of neuroanatomy, neurophysiology, and evolutionary and developmental neurobiology. Prerequisite: BIO 2450 with a grade of "C" or better.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Grade Mode: Standard Letter

BIO 4301. Evolution.

Basic genetic principles applied to natural selection, adaptation, populations, speciation and man's future. Consideration is given to the origin of life, nature of chromosomal variation, evolution of genetic systems and certain other selected topics. Prerequisite: BIO 2450 with a grade of "C" or better.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Grade Mode: Standard Letter

BIO 4304. Wildlife and Recreation: Impact, Policy, and Management.

Students will be introduced to the impact human recreational activities have on wildlife habitats and populations. Management practices to enhance human-wildlife encounters or to minimize detrimental effects on wildlife populations will be presented. Prerequisite: BIO 4416 with a grade of "C" or better.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Grade Mode: Standard Letter

BIO 4305. Nature Study.

This course provides a comprehensive survey of natural events. It includes laboratory and field work emphasizing observation, collection and discovery of relationships. It is creditable only for those seeking elementary or middle school certification and is required for those seeking grade 4-8 Science or Science/Mathematics teaching certification. This course must be taken the semester immediately prior to student teaching.

3 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

Course Fee: \$20; Fee - Lab BIO

BIO 4311. Cancer Biology.

Cancer Biology provides a foundation for understanding the complex molecular, biochemical, and cellular processes associated with cancer development. Topics include the role of tumor suppressor genes, oncogenes, DNA repair, apoptosis, ECM, cell-cycle control, cell signaling pathways, immune function and cancer-causing viruses. Emerging diagnostics and/or therapeutics will also be discussed. Prerequisite:

BIO 2450 Genetics with a grade of "C" or better; or approval of instructor.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Grade Mode: Standard Letter

BIO 4319. Biological Resources: Conservation and Planning.

This course is an introduction to the protection and sustainable use of populations, species, habitats, and ecosystems. Course also includes study of the methods used to analyze biodiversity and population regulation. Prerequisite: BIO 4416 with a grade of "D" or better, or concurrent enrollment.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Grade Mode: Standard Letter

BIO 4326. Immunology.

This lecture-based course will cover the biology of the immune system and its relationship to disease, emphasizing B and T cell immunity, immune diseases, hypersensitivities, transplantation, and cancer. Prerequisites: BIO 2400 and BIO 2450 with grades of "C" or better.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Grade Mode: Standard Letter

BIO 4327. Issues in Irish Biodiversity and Conservation.

In this course, students will learn about Irish flora and fauna, ecosystems, conservation strategies in areas of high ecological concern, and public involvement. Emphasis will be placed on case studies and service-learning opportunities. Prerequisite: BIO 1331 and BIO 1131, student must be accepted into the Texas State in Ireland Study Abroad Program. Corequisite: BIO 4328.

3 Credit Hours. 1 Lecture Contact Hour. 3 Lab Contact Hours.

Grade Mode: Standard Letter

BIO 4328. Field Biology of Ireland.

In this course, students will use multiple techniques to explore biodiversity across multiple ecosystems in Ireland. Prerequisite: BIO 1331 and BIO 1131, student must be accepted into the Texas State in Ireland Study Abroad program. Corequisite: BIO 4327.

3 Credit Hours. 0 Lecture Contact Hours. 12 Lab Contact Hours.

Grade Mode: Standard Letter

BIO 4337. Biology and Conservation of Sharks.

This course examines the biology and conservation of sharks and their relatives (skates, rays, chimaeras, and sawfish). Topics to be examined include evolutionary history, distribution, anatomy and physiology, daily movements and migration, diet, reproduction, relationship with humans, fisheries, conservation, and field methods used in shark research. Prerequisite: BIO 1331 with a grade of "C" or better.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Grade Mode: Standard Letter

BIO 4343. Fish Physiology.

This course examines the primary physiological functions in fish, including how fish sense and interact with the environment, maintain their energetic metabolism (respiration, digestion and excretion), reproduce and maintain water balance. Students will learn about the diverse adaptations fish use to cope with environmental and physiological challenges. Prerequisite: BIO 2450 with a grade of "C" or better.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Grade Mode: Standard Letter

BIO 4350B. Biological Implications of Water Planning in Texas.

Current topics in understanding the biological implications of water planning in Texas. This course will be of particular interest to students who have a background in aquatic biology and who intend to stay in Texas post-graduation. Prerequisites will be determined by topic and faculty offering the course. May be repeated once with different emphasis.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Course Attribute(s): Exclude from 3-peat Processing|Topics

Grade Mode: Standard Letter

BIO 4350D. Watershed Management Frameworks and Applications.

Introduction to integrated watershed assessment and management tools for identifying programmatic water quality and quantity issues and their root causes and solutions, and their practical application. The scientific and socio-economic elements are considered within the context of planning and developing watershed protection plans and programs. Prerequisite: Instructor approval.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Course Attribute(s): Exclude from 3-peat Processing|Topics

Grade Mode: Standard Letter

BIO 4350E. Techniques in Aquatic Biology.

This course will provide hands on experience with a suite of physical, chemical, and biological sampling techniques and gear used in applied river studies. Students will be exposed to the fundamentals of data quality objectives, accuracy, precision, detection limits, data visualization, exploratory analysis, univariate and multivariate statistics.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Course Attribute(s): Exclude from 3-peat Processing|Topics

Grade Mode: Standard Letter

BIO 4350I. Bird Conservation and Management.

This course is an introduction to the conservation and management of bird populations in an ecological context. Course covers a variety of species and spatial scales from landscape to ecoregion. Laboratory portion will involve field trips, intensive computer-based labs, and class discussion. Prerequisites: BIO 4416 or concurrent enrollment.

3 Credit Hours. 2 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Exclude from 3-peat Processing|Topics

Grade Mode: Standard Letter

BIO 4350J. Environmental Physiology of Animals.

This course is a study of how animals respond physiologically to changes in environmental temperature, moisture, salinity, partial pressure of gases, and toxins. Prerequisites: BIO 1330 and BIO 1331 and BIO 2450, all with grades of "C" or better.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Course Attribute(s): Exclude from 3-peat Processing|Topics

Grade Mode: Standard Letter

BIO 4350K. Genomics.

The course is a lecture covering modern genomics, including principles of genome function, the human genome, comparative genomics, genome sequencing, evolution and genomic change, databases and medicine, ethical, legal and social issues. The course also includes discussion of transcriptomics, proteomics, metabolomics, directed evolution, protein design, and systems biology. Prerequisite: BIO 2450 with a grade of "C" or better.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Course Attribute(s): Exclude from 3-peat Processing|Topics

Grade Mode: Standard Letter

BIO 4350L. Bacterial Genetics.

This course will cover concepts and mechanisms involved in the genetics of Archaea and Bacteria.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Course Attribute(s): Exclude from 3-peat Processing|Topics

Grade Mode: Standard Letter

BIO 4350M. Wildlife Policy and Law in North America.

This course provides the student with a historical and cultural context within which wildlife policy and law have developed in North America, particularly in the United States. Federal treaties, statutes, case law, and regulations pertaining to wildlife will be presented. Wildlife law from representative states will be referenced as well. Corequisite: BIO 4423 or BIO 4435 with a grade of "C" or better.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Course Attribute(s): Exclude from 3-peat Processing|Topics

Grade Mode: Standard Letter

BIO 4350N. Aquatic Toxicology.

This course examines the basic concepts of aquatic toxicology, including uptake mechanisms, interactions and elimination of different toxicants. Students will understand how toxic substances impact freshwater and marine environments and identify potential health impacts to humans. Topics to be discussed include nutrients, metals, petroleum, radionuclides, plastics and emerging contaminants. Restricted to Junior standing. Prerequisite: A minimum 2.5 Overall GPA.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Course Attribute(s): Exclude from 3-peat Processing|Topics

Grade Mode: Standard Letter

BIO 4350O. Tropical Ecology and Conservation.

Students will obtain a first-hand knowledge of the ecology, biodiversity, conservation, and culture of tropical ecosystems. It is an immersive and intensive study abroad course combining traditional lecture and field-based laboratory instruction. All course work will be conducted during a ~1 month stay in the South American country of Ecuador. Restricted to Juniors and Seniors with a minimum 2.50 Overall GPA. Co-requisite: BIO 4350P with a grade of "D" or better.

3 Credit Hours. 6 Lecture Contact Hours. 0 Lab Contact Hours.

Course Attribute(s): Exclude from 3-peat Processing|Topics

Grade Mode: Standard Letter

BIO 4350P. Tropical Ecology and Conservation Lab.

This laboratory course complements the lecture course BIO 4350O, in which students will obtain a first-hand knowledge of the ecology, biodiversity, conservation, and culture of tropical ecosystems. It is an immersive and intensive study abroad course combining traditional lecture and field-based laboratory instruction in tropical ecosystems. Corequisite: BIO 4350O.

3 Credit Hours. 0 Lecture Contact Hours. 9 Lab Contact Hours.

Co-requisite(s): BIO 4350O

Course Attribute(s): Exclude from 3-peat Processing|Topics

Grade Mode: Standard Letter

BIO 4350Q. Biological Oceanography.

Students will be introduced to the principles of oceanography and will understand anthropogenic impacts on the oceans. Topics to be investigated will include: ocean formation and destruction, sediments, ocean circulation, waves, tides, estuaries, life in the oceans, hydrothermal vents, coral reefs, fisheries, marine pollution, and climate change. Must be at least a Junior to enroll with a minimum 2.5 Overall GPA.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Course Attribute(s): Exclude from 3-peat Processing|Topics

Grade Mode: Standard Letter

BIO 4350R. Microbial Biotechnology.

This course provides an overview of how microbes (e.g., bacteria, viruses and yeast) are manipulated to solve practical problems through biotechnology. It is designed on topics of applied microbiology recommended by American Society of Microbiology. Prerequisites: BIO 2400 and BIO 2450 (or equivalent), with a grade of "C" or higher.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Course Attribute(s): Exclude from 3-peat Processing|Topics

Grade Mode: Standard Letter

BIO 4350S. Marine Resources.

This course examines the economic importance of marine resources and the exploitation and fragility of the marine environment. Topics to be examined include ocean ownership, overfishing, aquaculture, shark finning, whaling, ocean mining, marine transportation, tourism, pollution, harvesting energy from the ocean and the importance of creating marine reserves.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Course Attribute(s): Exclude from 3-peat Processing|Topics

Grade Mode: Standard Letter

BIO 4350T. Field Biology of Ireland.

In this course, students will use multiple techniques to explore biodiversity across multiple ecosystems in Ireland. Must be accepted into the Texas State in Ireland Study Abroad program.

3 Credit Hours. 0 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Exclude from 3-peat Processing|Topics

Grade Mode: Standard Letter

BIO 4350U. Ecology of Rarity.

This course will examine the ecology of rarity and its ability to inform public awareness and environmental policy. This course will explore how we define rarity, persistence and viability, is rarity more or less common than might be expected, and is there anything we can or should do about it? Prerequisite: BIO 4416.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Course Attribute(s): Exclude from 3-peat Processing|Topics

Grade Mode: Standard Letter

BIO 4350V. Fish Physiology.

This course examines the primary physiological functions in fish, including how fish sense and interact with the environment, maintain their energetic metabolism (respiration, digestion and excretion), reproduce and maintain water balance. Students will learn about the diverse adaptations fish use to cope with environmental and physiological challenges. Prerequisite: BIO 2450 with a grade of "C" or better.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Course Attribute(s): Exclude from 3-peat Processing|Topics

Grade Mode: Standard Letter

BIO 4350W. Biology and Conservation of Sharks.

This course examines the biology and conservation of sharks and their relatives (skates, rays and sawfish). Topics to be examined include evolutionary history, distribution, anatomy and physiology, daily movements and migration, diet, reproduction, relationship with humans, fisheries, conservation, and field methods used in shark research. Prerequisite: BIO 2450 with a grade of "C" or better.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Course Attribute(s): Exclude from 3-peat Processing|Topics

Grade Mode: Standard Letter

BIO 4350X. Issues in Irish Biodiversity and Conservation.

In this course, students will learn about Irish flora and fauna, ecosystems, conservation strategies in areas of high ecological concern, and public involvement. Emphasis will be placed on case studies and service-learning opportunities. Prerequisite: BIO 1331 & BIO 1131, Plus student must be accepted into the Texas State in Ireland Study Abroad Program. Corequisite: BIO 4350T.

3 Credit Hours. 1 Lecture Contact Hour. 3 Lab Contact Hours.

Course Attribute(s): Exclude from 3-peat Processing|Topics

Grade Mode: Standard Letter

BIO 4350Y. Introduction to Laboratory Research Methods.

This course is for students interested in undergraduate research and introduces the fundamental methods and practices utilized in biological research labs. This hands on course covers keeping a lab notebook, following standard protocols, and collecting/analyzing data. Student will be introduced to current research programs offered in the Biology department. Prerequisite: BIO 1330 and BIO 1331 with grades of "C" or better.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Course Attribute(s): Exclude from 3-peat Processing|Topics

Grade Mode: Standard Letter

BIO 4350Z. Diversity and Cultural Impact of Geoparks.

Students will explore biological differences in diversity across Geoparks in the United States and Ireland. Additionally, students will study the cultural impact that Geoparks have on the local community and national policy by focusing on differences between science communication strategies and community engagement practices conducted at the parks. Prerequisite: Accepted into the summer Texas State Study Abroad program in Ireland.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Course Attribute(s): Exclude from 3-peat Processing|Topics

Grade Mode: Standard Letter

BIO 4351A. Vertebrate Endocrinology.

This course teaches function and organization of the endocrine system. It describes the major endocrine glands, the synthesis and release of their hormone products, and the interaction with target tissues. Endocrine control of digestion, growth, reproduction, and homeostasis will be compared between mammals and other vertebrate groups. Prerequisite: BIO 2450 and CHEM 2342, all with a grade of "C" or better.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Course Attribute(s): Exclude from 3-peat Processing|Topics

Grade Mode: Standard Letter

BIO 4351B. Raptor Ecology.

This course will examine the evolution, taxonomy, ecology, behavior, anatomy, physiology, and conservation of birds of prey of the world with emphasis on diurnal raptors, including those from Texas. Field trips will include two or more weekend day trips, and two overnight weekend trips.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Course Attribute(s): Exclude from 3-peat Processing|Topics

Grade Mode: Standard Letter

BIO 4351C. Introduction to Biotechnology.

This course is an introduction to biotechnology which provides an insight to how biotechnological applications can solve scientific and societal problems for the benefit of humankind. Prerequisite: BIO 1330 and BIO 1331.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Course Attribute(s): Exclude from 3-peat Processing|Topics

Grade Mode: Standard Letter

BIO 4351D. Ecology of Temporary Waters.

Temporary waters (which regularly go dry) are often overlooked. This course explores their diversity, their ecological role and how these systems are impacted by humans. We will also look at the species that rely on temporary waters, their special adaptations, and their populations and community dynamics.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Course Attribute(s): Exclude from 3-peat Processing|Topics

Grade Mode: Standard Letter

BIO 4351G. Omics Approach to Microbiology.

The course will discuss contemporary approaches, techniques and bioinformatic tools used to study function and ecology in microbial communities. Topics covered will include microbiome, next-generation sequencing, and metaproteomics. Prerequisite: BIO 2450.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Course Attribute(s): Exclude from 3-peat Processing|Topics

Grade Mode: Standard Letter

BIO 4366. Medical Microbiology.

This lecture-based course will cover pathogenic bacteria and their relationship to disease, epidemiology and the biological basis for virulence. Prerequisites: BIO 2400 and BIO 2450 with grades of C or higher. Students may take only one of BIO 4345, BIO 4350G or BIO 4445 for credit.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Grade Mode: Standard Letter

BIO 4369. Biosystematics.

Biological systematics is a multidisciplinary component of most biological disciplines. Course topics include: classification schemes, homology, homoplasy, the application of nomenclature, and phylogeny reconstruction. The course will also present relevant issues in conservation, biodiversity cataloguing, museum and collection management, and identification methods/dichotomous keys. Prerequisite: BIO 2450 with a grade of "C" or better.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Grade Mode: Standard Letter

BIO 4376. Microbial Biotechnology.

This course provides an overview of how microbes (e.g., bacteria, viruses and yeast) are manipulated to solve practical problems through biotechnology. This course is based on topics of applied microbiology as recommended by American Society of Microbiology. Prerequisite: BIO 2400 and BIO 2450, all with a grade of "C" or better.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Course Attribute(s): Writing Intensive

Grade Mode: Standard Letter

BIO 4377. Genome Informatics.

The course will cover basic knowledge on genomics and its bioinformatics tools. Students will learn current topics on genomics and bioinformatics, and will analyze genomic data using statistical software. All the analyses will be performed using a personal and a cluster computer. Prerequisite: BIO 2450 with a grade of "C" or better.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Grade Mode: Standard Letter

BIO 4400. Plants Important for Wildlife.

This course explores plant and plant part (specifically gall, fruit, seed, and twig) identification, phylogenetics, co-evolution of plant defenses, economic and ecological impacts of plant uses by wildlife. Prerequisite: BIO 2410 or BIO 2450 all with a grade of "C" or better.

4 Credit Hours. 3 Lecture Contact Hours. 2 Lab Contact Hours.

Grade Mode: Standard Letter

BIO 4402. Earth Science I.

The description and interpretation of earth phenomena considered from the standpoint of meteorology and astroscience. Includes field observations, methods of measurement and interpretation of data related to the physical environment and space technology. May not be counted toward a major or minor in biology. Required for those seeking grade 4-8 Science and Mathematics/Science certification.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

Course Fee: \$20; Fee - Lab BIO

BIO 4403. Earth Science II.

The description and interpretation of earth phenomena considered from the standpoint of geology and oceanography. Includes field observations, methods of sampling and interpretation of data related to the physical environment. May not be counted toward a major or a minor in biology. Required for those seeking grade 4-8 Science and Mathematics/Science certification.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

Course Fee: \$20; Fee - Lab BIO

BIO 4408. Science Processes and Research.

Students will analyze scientific research design, design research, interpret data, and communicate results. Stress will be placed on broad-field structure and integration of major science concepts and research-based science pedagogy. This course must be taken the semester prior to student teaching and is required for those seeking 7-12 Life Science or Science teacher certification. This course may not count as one of the four upper-level Biology courses required of general Biology majors, or one of the three upper-level Biology courses required of Biology minors.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

Course Fee: \$20; Fee - Lab BIO

BIO 4410. Field Biology of Plants.

Ecological relationships and natural history of plants, including historical geology, geography, soils, vegetational regions and surface geology of central Texas. Emphasis is placed on plant-soil-water relationships to develop conservation concepts. Students will make a representative collection of plants. Prerequisite: BIO 2450 with a grade of "C" or better.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

Course Fee: \$20; Fee - Lab BIO

BIO 4411. Morphology of the Vascular Plants.

The structure, life-cycles and evolution of fossil and living vascular plants. Emphasis on such topics as the origin of land plants, evolution of the ovule, angiospermy, the flower and fruit. Prerequisites: BIO 2450 with a grade of "C" or better; one year of Chemistry.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

Course Fee: \$20; Fee - Lab BIO

BIO 4412. Plant Anatomy.

The anatomy of vascular plants stressing descriptive, development and comparative aspects of seed plants and the anatomical adaptations of plants to environmental factors. Prerequisites: BIO 2450 with a grade of "C" or better; one year of Chemistry.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

Course Fee: \$20; Fee - Lab BIO

BIO 4413. Parasitology.

The biology and biological significance of the common parasites of man and animals. Prerequisites: BIO 2411 and BIO 2450, all with a grade of "C" or better.

4 Credit Hours. 3 Lecture Contact Hours. 4 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

Course Fee: \$20; Fee - Lab BIO

BIO 4415. Ichthyology.

An introduction to the morphology, taxonomy, natural history and evolution of fishes. Field trips will be made to collect specimens and laboratory periods will be devoted to morphological and systematic analysis. Prerequisites: BIO 2411 and BIO 2450, all with a grade of "C" or better.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

Course Fee: \$20; Fee - Lab BIO

BIO 4416. General Ecology.

The ecological relationships that exist between organisms and those relationships that exist between organism and environment. Laboratory sessions will be devoted to literature review and/or specific ecological problems. This course or BIO 4454 is required of all biology majors. Prerequisites: BIO 2450; BIO 2410 or BIO 2411 or BIO 2400, with a grade of "C" or better. (WI).

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required|Writing Intensive

Grade Mode: Standard Letter

Course Fee: \$5; Fee - Lab BIO

BIO 4418. Field Ornithology.

This course is designed to introduce and provide an advanced knowledge of the application of various field, laboratory, and statistical methods and techniques in the study of avian species. The course will include topics related to survey methodology, sampling design, marking/banding, measurement/sample extraction, and aging/sexing of avian species.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

BIO 4420. Natural History of the Vertebrates.

Environmental relationships and natural history of vertebrates. Emphasis is upon taxonomy, speciation and biotic provinces. The laboratory will include field trips for the study and collection of animals in their natural habitats. Students will assemble a representative collection of animals. Prerequisites: BIO 2411, BIO 2450 with a grade of "C" or higher and permission of instructor required for non-wildlife majors. (WI).

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required|Writing Intensive

Grade Mode: Standard Letter

Course Fee: \$20; Fee - Lab BIO

BIO 4421. Ornithology.

Introduction to anatomy, behavior, ecology and identification of birds of Texas. Laboratory will emphasize field studies of birds and their habitat requirements. Prerequisites: BIO 2411 and BIO 2450 with a grade of "C" or better.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

Course Fee: \$20; Fee - Lab BIO

BIO 4422. Mammalogy.

The taxonomy, distribution, ecology, behavior and evolution of mammals with particular emphasis on wild animals of the southwest. Laboratory will emphasize anatomy, identification, preparation of specimens and field exercises in the methods of population analysis. Prerequisites: BIO 2411 and BIO 2450 with a grade of "C" or higher. BIO 4416 is also recommended.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

Course Fee: \$20; Fee - Lab BIO

BIO 4423. Wildlife Management.

Applications of the principles of ecology and natural history to the management of wildlife habitats and control of wildlife populations. Laboratory will involve demonstrations and practice exercises with wildlife management techniques and instrumentation and field trips to observe wildlife management projects. Prerequisites: BIO 2410 and BIO 2411 and BIO 2450, all with a grade of "C" or better. BIO 4416 or BIO 4421 or BIO 4422 is also recommended. (WI).

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required|Writing Intensive

Grade Mode: Standard Letter

Course Fee: \$20; Fee - Lab BIO

BIO 4425. Biometry.

Basic principles of statistical methods as applied to biological problems such as sampling techniques, analysis of data, experimental design and population dynamics. Emphasis will be on practical application. Prerequisites: BIO 2450 with a grade of "C" or higher; MATH 1315.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

BIO 4434. Herpetology.

A course treating the origin and evolution of amphibians and reptiles; their reproductive and physiological tactics; taxonomy/systematics; and population biology. Emphasis will be placed on North American species and those groups inhabiting Texas. Prerequisites: BIO 2411 and BIO 2450 with a grade of "C" or better.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

Course Fee: \$20; Fee - Lab BIO

BIO 4435. Techniques in Wildlife Management.

The basic methodology of practical wildlife management. This involves techniques in monitoring and data collection related to population dynamics and habitat parameters of wildlife species. Prerequisites: BIO 2411 and BIO 2450 with a grade of "C" or better and permission of instructor required for non-wildlife majors.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

Course Fee: \$20; Fee - Lab BIO

BIO 4436. Tropical Biology.

This course entails an analysis and evaluation of the governing principles of tropical ecosystems, including wildlife ecologies, geological processes, and environmental-cultural interactions. In the laboratories, students will compare ecological relationships that influence tropical biology, discuss peer-reviewed literature and examine tropical flora and fauna during field trips to regional sub-tropical areas. Prerequisite: BIO 2410 and BIO 2411, and BIO 2450, all with a grade of "C" or better.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Grade Mode: Standard Letter

BIO 4441. Cellular Physiology.

Advanced cellular biology, including membrane physiology, thermodynamics, energy transduction and distribution, and cellular movement in non-muscle and muscle cells. Laboratory includes discussion of current research and exercises in cellular physiology. Prerequisites: BIO 2450 and CHEM 2330 or CHEM 2341 or CHEM 2342 all with a grade of "D" or better. (WI).

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required|Writing Intensive

Grade Mode: Standard Letter

Course Fee: \$10; Fee - Lab BIO

BIO 4442. Experimental Techniques.

Use of methods and instruments applicable to biological investigations, including colorimetry; UV-spectrophotometry; fluorescence; flame and atomic absorption spectrophotometry; paper, gas, gel filtration and ion exchange chromatography; radioactive counting; and electrophoresis. Prerequisite: BIO 2450 with a grade of "C" or better.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

Course Fee: \$20; Fee - Lab BIO

BIO 4446. Microbial Ecology.

This course will illustrate the wide variety of bacteria in nature, their interactions with other organisms and the environments, and their roles in global cycling of elements such as carbon, nitrogen, and sulfur. The laboratories will feature enrichments for selected groups of microorganisms (sulfate reducers, nitrogen fixers) and analysis of these isolates by microscopy, gas chromatography and radiochemical substrate utilizations. Prerequisites: BIO 2400 and BIO 2450 with a grade of "C" or better. (WI).

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required|Writing Intensive

Grade Mode: Standard Letter

Course Fee: \$25; Fee - Lab BIO

BIO 4447. Microbial Physiology and Genetics.

This course will cover fundamental concepts in bacterial physiology and genetics, including central and specialized metabolism, and unique aspects of bacterial genetics. Prerequisites: BIO 2400 and BIO 2450; CHEM 2142 and CHEM 2342, all with a grade of "C" or better. (WI).

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required|Writing Intensive

Grade Mode: Standard Letter

Course Fee: \$30; Fee - Lab BIO

BIO 4448. Bacterial Genetics.

This course will cover concepts and mechanisms involved in the genetics of Archaea and Bacteria. Prerequisite: BIO 2400 and BIO 2450, all with a grade of "C" or better.

4 Credit Hours. 3 Lecture Contact Hours. 1 Lab Contact Hour.

Course Attribute(s): Writing Intensive

Grade Mode: Standard Letter

BIO 4450. Physiological Ecology of Animals.

This course will cover fundamental concepts in bacterial physiology and genetics, including central and specialized metabolism, and unique aspects of bacterial genetics. Prerequisites: BIO 2400, BIO 2450; CHEM 2142, CHEM 2342 with a grade of "C" or higher.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

Course Fee: \$10; Fee - Lab BIO

BIO 4454. Plant Ecology.

Physiological ecology and community structure and function in the organization of terrestrial plant ecosystems. Quantitative vegetational sampling and the use of field and laboratory physiological equipment are included in the laboratory. (WI) Prerequisite: BIO 2450 with a grade of "C" or better.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required|Writing Intensive

Grade Mode: Standard Letter

Course Fee: \$25; Fee - Lab BIO

BIO 4464. Vertebrate Anatomy.

This course is a comparative study of vertebrate anatomy. Fossil histories are evaluated to understand how vertebrate radiation occurred in the geological past, along with changes in structure of organs and organ systems. Lab includes dissection of representative members of each major vertebrate group. Prerequisite: BIO 2450 with a grade of "C" or better. (WI).

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Exclude from 3-peat Processing|Lab Required|Writing Intensive

Grade Mode: Standard Letter

Course Fee: \$10; Fee - Lab BIO

BIO 4465. General Entomology.

Principles of morphology, physiology and taxonomy of insects. Laboratory time will be devoted to a taxonomic study of the common orders and families of insects. Prerequisites: BIO 2411 and BIO 2450 with a grade of "C" or better.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

Course Fee: \$10; Fee - Lab BIO

BIO 4470. Limnology.

The physical, chemical, and biological factors affecting productivity in lakes, ponds, and streams. Limnological sampling methods, chemical, and biological analysis of samples and hydrographic surveying are included in the laboratory. Prerequisites: BIO 2450 with a grade of "C" or better; one year of chemistry. (WI).

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required|Writing Intensive

Grade Mode: Standard Letter

Course Fee: \$25; Fee - Lab BIO

BIO 4472. Animal Behavior.

This course presents all the major facets of the study of animal behavior, giving special attention to its evolution and ecological significance. We will discuss major conceptual models guiding past and present research in the field. Laboratories will emphasize experimental techniques and statistical analysis. Prerequisites: BIO 2450; and BIO 2400, BIO 2410, or BIO 2411 with a grade of "C" or better. (WI).

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required|Writing Intensive

Grade Mode: Standard Letter

Course Fee: \$5; Fee - Lab BIO

BIO 4480. Cytology and Microtechnique.

A study of cellular structure and microscopic technique. The lecture portion of the course presents cytology of all cell types and theoretical aspects of microscopy including light and electron-based technologies. The laboratory portion of the course provides training in standard light and electron microscopy, laser scanning confocal microscopy, and digital microscopy. Prerequisite: BIO 2450 with a grade of "C" or better.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

Course Fee: \$20; Fee - Lab BIO

BIO 4481. Internship in Biological Laboratory Technologies.

The student will participate in the work of a selected biology unit (private, commercial, or governmental). A research paper, reporting the internship experience conducted at the biological unit under the supervision of a faculty member, will be required. This course may be credited toward a biology major with prior approval of the biology department adviser and chair. Prerequisite: BIO 2450 with a grade of "C" or better.

4 Credit Hours. 0 Lecture Contact Hours. 15 Lab Contact Hours.

Grade Mode: Standard Letter

Course Fee: \$10; Fee - Lab BIO

Courses in General Science (GS)

GS 3310. General Science.

This course is a laboratory course designed to acquaint the student with the fundamentals of chemistry and earth space science. It is non-creditable for science majors but is a required course for Elementary EC-6 Generalist certification. Prerequisites: PHYS 1310, PHYS 1320, and PHYS 1110; or PHYS 1410 and PHYS 1420 all with grades of "C" or higher.

3 Credit Hours. 3 Lecture Contact Hours. 2 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

GS 3320. General Science.

This course is a laboratory course designed to acquaint the student with the fundamentals of biological science. It is non-creditable for science majors but is a required course for Elementary EC-6 Generalist certification. Prerequisite: BIO 1320, BIO 1421, BIO 1330 and BIO 1130, or BIO 1331 and BIO 1131 completed with a grade of "C" or higher.

3 Credit Hours. 3 Lecture Contact Hours. 2 Lab Contact Hours.

Course Attribute(s): Lab Required

Grade Mode: Standard Letter