**BIOLOGY (BIO)**

**NOTE:** All prerequisites for Biology (BIO) courses must be completed with a grade of "C-" or better.

**Biology (BIO) Courses**

**BIO 1033. Drugs and Society.** (3-0) 3 Credit Hours. *(TCCN = PHED 1346)*
An examination of licit and illicit drugs and their biosocial effects. Topics include pharmacology of alcohol, stimulants, hallucinogens, addiction, and abuse. May be applied toward the Core Curriculum requirement in Social and Behavioral Sciences. Generally offered: Fall, Spring. Course Fees: LRC1 $12; LRS1 $45; STSI $21.

**BIO 1053. Introductory Microbiology.** (3-0) 3 Credit Hours. *(TCCN = BIOL 2320)*
Prerequisite: BIO 1233 or BIO 1404. A general study of microorganisms, their characteristics, isolation, growth, and importance in nature, industry, public health, and human disease. (Formerly AHS 1053. Credit cannot be earned for both BIO 1053 and AHS 1053. BIO 1053 cannot substitute for BIO 3713.) Generally offered: Fall, Spring. Course Fees: LRS1 $45; STSI $21.

**BIO 1061. Introductory Microbiology Laboratory.** (0-3) 1 Credit Hour. *(TCCN = BIOL 2120)*
Prerequisite: BIO 1233 or BIO 1404, and completion of or concurrent enrollment in BIO 1053. Course provides basic microbiology lab skills and procedures, with emphasis on the growth, identification, and control of microbes of concern to health-care professionals. Immunodeficient and pregnant students must contact the Coordinator, Microbiology Teaching Labs, for additional instructions prior to the class start date. (Formerly AHS 1061. Credit cannot be earned for both BIO 1061 and AHS 1061. BIO 1061 cannot substitute for BIO 3722.) Generally offered: Fall, Spring, Summer. Course Fees: IUB1 $10; L001 $30; LRS1 $15; STSI $7.

**BIO 1233. Contemporary Biology I.** (3-0) 3 Credit Hours. *(TCCN = BIOL 1308)*
This is the first course in a two-part introduction to the science of biology for non-majors. This course focuses on the chemical basis of life, principles of inheritance, principles of evolution and biodiversity. May be applied toward the Core Curriculum requirement in Life and Physical Sciences. May not be applied to a B.S. degree in Biology or B.S. degree in Microbiology and Immunology. Generally offered: Fall, Spring. Course Fees: LRC1 $12; LRS1 $45; STSI $21.

**BIO 1243. Contemporary Biology II.** (3-0) 3 Credit Hours. *(TCCN = BIOL 1309)*
This is the second course in a two-part introduction to the science of biology for non-majors. This course focuses on evolution, animal and plant physiology, and ecology. May be applied toward the Core Curriculum requirement in Life and Physical Sciences. May not be applied to a B.S. degree in Biology or the B.S. degree in Microbiology and Immunology. Generally offered: Fall, Spring, Summer. Course Fees: DL01 $75; LRC1 $12; LRS1 $45; STSI $21.

**BIO 1041. Biosciences I.** (3-4) 4 Credit Hours. *(TCCN = BIOL 1406)*
Prerequisite: Completion of or concurrent enrollment in one of the following: STA 1053, MAT 1023, MAT 1073, or higher. This is the first course in a two-part introduction to the science of biology for students majoring in biology or interested in pre-health professions. Topics include biochemistry, cell biology, genetics and molecular biology. The course includes 3 hours of lecture and a mandatory 3.5-hour laboratory per week. May be applied toward the Core Curriculum requirement in Life and Physical Sciences. (Formerly BIO 1113 and BIO 1203. Credit cannot be earned for both BIO 1404 and BIO 1113 or BIO 1203.) Generally offered: Fall, Spring, Summer. Course Fees: IUB1 $10; L001 $30; LRC1 $16; LRS1 $60; STSI $28.

**BIO 1414. Biosciences II.** (3-4) 4 Credit Hours. *(TCCN = BIOL 1407)*
Prerequisites: BIO 1404 and completion of or concurrent enrollment in one of the following: STA 1053, MAT 1023, MAT 1073, or higher. This is the second course in a two-part introduction to the science of biology for students majoring in biology or interested in pre-health professions. Topics include evolutionary biology, biotic diversity, plant structure and function, and ecology. The course includes 3 hours of lecture and a mandatory 3.5-hour laboratory per week. May be applied toward the Core Curriculum requirement in Life and Physical Sciences. (Formerly BIO 1143, BIO 1223 and BIO 1413. Credit cannot be earned for more than one of the following: BIO 1143, BIO 1223, BIO 1413, BIO 1414, or ES 2013.) Generally offered: Fall, Spring, Summer. Course Fees: IUB1 $10; L001 $30; LRC1 $16; LRS1 $60; STSI $28.

**BIO 2003. Biology of Human Reproduction.** (3-0) 3 Credit Hours.
An in-depth look at human reproductive anatomy, physiology, and behavior. Topics to be considered include anatomy, sex differentiation, neuroendocrine physiology, conception and development, birth control, and sexually transmitted diseases. (Formerly BIO 1023. Credit cannot be earned for both BIO 2003 and BIO 1023.) Generally offered: Spring. Course Fees: LRS1 $45; STSI $21.

**BIO 2043. Nutrition.** (3-0) 3 Credit Hours. *(TCCN = BIOL 1322)*
Prerequisite: BIO 1233 or BIO 1404. In-depth study of nutrient classes in foods: their ingestion, digestion, absorption and utilization by the human body. Clinical consequences of nutrient deficiency or excess, and Medical Nutrition Therapy to complement management of disease. (Formerly AHS 2043. Same as NDT 2043. Credit cannot be earned for more than one of the following courses: AHS 2043, BIO 2043, or NDT 2043.) Generally offered: Fall, Spring, Summer. Course Fees: LRS1 $45; STSI $21.

**BIO 2051. Human Anatomy and Physiology Laboratory I.** (0-3) 1 Credit Hour. *(TCCN = BIOL 2101)*
Prerequisite: BIO 1233 or BIO 1404. Concurrent enrollment in BIO 2053 is recommended. This laboratory supplements the BIO 2053 lecture. It is the first of a two-course laboratory sequence that uses both dissections of representative organisms and laboratory experimentation to study human anatomical systems and physiological processes. (Credit cannot be earned for both BIO 2051 and BIO 2091. BIO 2051 cannot substitute for BIO 3422.) Generally offered: Fall, Spring, Summer. Course Fees: IUB1 $10; L001 $30; LRS1 $15; STSI $7.
BIO 2053. Human Anatomy and Physiology I. (3-0) 3 Credit Hours. (TCCN = BIOL 2301)
Prerequisite: BIO 1233 or BIO 1404. Concurrent enrollment in BIO 2051 is recommended. This is the first of a two-course sequence that provides an integrative study of the anatomy and physiology of the human body with an emphasis on the structure/function interrelationships between organ systems. Topics covered include cell and tissue biology, the integumentary, skeletal, muscular, and nervous systems. (Credit cannot be earned for both BIO 2053 and BIO 2083. BIO 2053 cannot substitute for BIO 3413.) Generally offered: Fall, Spring, Summer. Course Fees: LRS1 $45; STSI $21.

BIO 2061. Human Anatomy and Physiology Laboratory II. (0-3) 1 Credit Hour. (TCCN = BIOL 2102)
Prerequisite: BIO 2051. Concurrent enrollment in BIO 2063 is recommended. This laboratory supplements the BIO 2063 lecture. It is the second of a two-course laboratory sequence that uses both dissections of representative organisms and laboratory experimentation to study human anatomical systems and physiological processes. (Credit cannot be earned for both BIO 2061 and BIO 2111. BIO 2061 cannot substitute for BIO 3422.) Generally offered: Fall, Spring, Summer. Course Fees: IUB1 $10; L001 $30; LRS1 $15; STSI $7.

BIO 2063. Human Anatomy and Physiology II. (3-0) 3 Credit Hours. (TCCN = BIOL 2302)
Prerequisite: BIO 2053. Concurrent enrollment in BIO 2063 is recommended. This is the second of a two-course sequence that provides an integrative study of the anatomy and physiology of the human body with an emphasis on the structure/function interrelationships between organ systems. Topics covered include the endocrine, digestive, respiratory, cardiovascular, lymphatic/immune, renal and reproductive systems. Human growth and development will also be covered. (Credit cannot be earned for both BIO 2063 and BIO 2103. BIO 2063 cannot substitute for BIO 3413.) Generally offered: Fall, Spring, Summer. Course Fees: LRS1 $45; STSI $21.

BIO 2313. Genetics. (3-0) 3 Credit Hours. (TCCN = BIOL 2316)
Prerequisites: BIO 1414 and completion or concurrent enrollment in one of the following: MAT 1093 (or higher) or STA 1053. Principles governing transmission of hereditary factors in plants and animals, with emphasis on molecular, biochemical, and population genetics. Generally offered: Fall, Spring, Summer. Course Fees: LRS1 $45; STSI $21.

BIO 2362. Molecular Genetics Laboratory. (1-4) 2 Credit Hours.
Prerequisites: BIO 1414, CHE 1103, and completion or concurrent enrollment in MAT 1093 or higher. A study of techniques used to investigate the inheritance of genetic information at the molecular level. Students will gain an understanding of the structure, function and regulation of genes. Techniques will include: nucleic acid biochemistry, molecular cloning mutagenesis and bioinformatics. (Formerly BIO 2322. Credit cannot be earned for both BIO 2362 and BIO 2322. Generally offered: Fall, Spring, Summer. Course Fees: LRS1 $45; STSI $21.

BIO 2953. Special Topics in Biology. (3-0) 3 Credit Hours.
An organized course offering the opportunity for specialized study not normally or not often available as part of the regular course offerings. Special Topics may be repeated for credit when the topics vary, but not more than 6 semester credit hours will apply to a bachelor's degree, regardless of discipline. No more than 6 semester credit hours of BIO 2953, BIO 4951, or BIO 4953 can be applied to a Bachelor of Science degree in Biology or Microbiology and Immunology. Course Fees: LRS1 $45; STSI $21.

BIO 3013. Introduction to Clinical Medicine and Pathology. (3-0) 3 Credit Hours.

BIO 3043. UTeachSA Research Methods. (3-0) 3 Credit Hours.
Prerequisite: This course is only open to students who are participating in the UTeachSA teacher preparation program. Students design and carry out independent inquiries, which they write up and present in the manner that is common in the scientific community. Inquiries incorporate mathematics and the various science disciplines to solve research problems. Only 6 semester credit hours of BIO 3043, BIO 4911-3, BIO 4923 and BIO 4993, in any combination, can be taken as BIO electives. Additional research hours of these courses (excluding Independent Study) may be taken as free electives, for a maximum of 12 research hours being applied to the bachelor's degree. (Credit cannot be earned for both BIO 3043 and UTE 3043.) Generally offered: Fall. Spring. Differential Tuition $150.

BIO 3123. Comparative Vertebrate Anatomy. (3-0) 3 Credit Hours.
Prerequisite: BIO 2123. A comparative analysis of developmental and adult anatomy of vertebrates (including human). Emphasis is placed on phylogenetic relationships between form, function and evolution. (Formerly BIO 2123. Credit cannot be earned for both BIO 2123 and BIO 3123.) Generally offered: Spring. Differential Tuition: $150.

BIO 3213. Animal Behavior. (3-0) 3 Credit Hours.
Prerequisite: BIO 2313 or consent of instructor. This course will introduce various approaches to the study of animals and their behavior in natural habitats. The course will examine basic principles derived from studying the evolution, ecology and development of animals, and use these principles to explain how and why animals behave as they do in particular situations. Generally offered: Fall, Summer. Spring. Differential Tuition $150.

BIO 3263. The Woody Plants. (2-3) 3 Credit Hours.
Prerequisite: BIO 2313 and junior or senior status: a minimum of 60 semester credit hours. A study of the woody plants emphasizing the characteristics of family, genus, and species. Includes identification of the common woody plants. Leaf, stem, and flower morphology, anatomy, and collecting techniques. Lecture, laboratory, and fieldwork will be included as part of the course. (Same as ES 3223. Credit cannot be earned for both BIO 3263 and ES 3223.) Generally offered: Fall. Spring. Differential Tuition: $150. Course Fee: STFB $40.

BIO 3273. Biology of Flowering Plants. (2-3) 3 Credit Hours.
Prerequisite: BIO 2313 and junior or senior status: a minimum of 60 semester credit hours. A study of the wildflowers of Texas emphasizing identification of the more common wildflowers, as well as family characteristics, flower anatomy, plant morphology, and plant-collecting techniques will be included. Lecture, laboratory, and fieldwork will be included as part of the course. (Same as ES 3213. Credit cannot be earned for both BIO 3273 and ES 3213.) Generally offered: Spring. Spring. Differential Tuition $150.

BIO 3283. Principles of Ecology. (3-0) 3 Credit Hours.
Prerequisite: BIO 1414. A study of the interaction of organisms with their environment, with focus on ecological principles, adaptations of organisms, environmental pollution, and principles of conservation. (Credit cannot be earned for both BIO 3283 and ES 3033.) Generally offered: Fall, Spring, Summer. Differential Tuition: $150.
BIO 3292. Principles of Ecology Laboratory. (0-6) 2 Credit Hours. 
Prerequisites: BIO 1414 and completion of or concurrent enrollment in BIO 3283. A field-oriented course emphasizing modern ecological techniques, including examinations of plant and animal populations and measurement of selected chemical and physical parameters. (Credit cannot be earned for both BIO 3292 and ES 3042.) Generally offered: Fall, Spring, Summer. Differential Tuition: $150. Course Fees: IUB1 $10; L001 $30; STFB $40.

BIO 3323. Evolution. (3-0) 3 Credit Hours. 
Prerequisite: BIO 2313. A discussion of theories and possible mechanisms for evolutionary changes at various levels of organization. Generally offered: Spring. Differential Tuition: $150.

BIO 3333. Plants and Society. (3-0) 3 Credit Hours. 
Prerequisite: BIO 2313. The importance of plants and plant-derived products to human health and wellbeing through the provision of food, pharmaceuticals, and other important natural products. (Formerly BIO 2343. Credit cannot be earned for both BIO 3333 and BIO 2343.) Generally offered: Spring. Spring. Differential Tuition $150.

BIO 3343. Plant Cell Biology. (3-0) 3 Credit Hours. 
Prerequisite: BIO 2313. A comprehensive study of the molecular structures and functions of plant cells and their integration into the whole plant system. (Formerly titled "Plant Sciences.") Generally offered: Spring. Spring. Differential Tuition $150.

BIO 3362. Molecular Biochemistry Laboratory. (1-4) 2 Credit Hours. 
Prerequisites: BIO 2362, CHE 1103, and completion of or concurrent enrollment in MAT 1093 or higher. A study of the microscopic, biochemical and molecular techniques used to investigate biochemical reactions and the structure and function of proteins in cells and tissues. Techniques will include; protein extraction, protein characterization, enzyme kinetics, chromatography, western blotting, Immunofluorescence and bioinformatics. (Credit cannot be earned for both BIO 3362 and any of the following: BIO 3522, BIO 3822, or BME 3114.) Generally offered: Fall, Spring, Summer. Differential Tuition: $100. Course Fees: IUB1 $10; L001 $30.

BIO 3382. Sophomore Research Initiative Peer Mentor. (0-0) 2 Credit Hours. 
Prerequisites: BIO 3362, completion of the Sophomore Research Initiative, and instructor consent. Student will be a peer mentor for students in the Sophomore Research Initiative (SRI) in a laboratory in which they were previously enrolled, and which they completed with a grade of "A" or "B". Students will work under the guidance of a graduate teaching assistant or laboratory coordinator. Besides assisting in the laboratory, students will be expected to attend group meetings associated with the laboratory, help with setup of the laboratories and complete a written assignment at the end of the semester. Students will not have any student grading responsibility. Cannot be repeated for credit. Differential Tuition: $100. Course Fees: IUB1 $10; L001 $30.

BIO 3413. Physiology. (3-0) 3 Credit Hours. 
Prerequisite: BIO 2313. This course is designed to develop the skills and competencies needed by students to understand the dynamic physiological processes underlying the maintenance of homeostatic balance in animals. Topics to be covered include endocrine, neural, muscular, cardiopulmonary and renal physiology. (BIO 2103 or BIO 3153 cannot substitute for BIO 3413.) Generally offered: Fall, Spring, Summer. Differential Tuition: $150.

BIO 3422. Physiology Laboratory. (1-5) 2 Credit Hours. 
Prerequisite: Completion or concurrent enrollment in BIO 3413. Basic understanding of the physiological processes in living systems employing methods and instruments of biological research. (BIO 2111 cannot substitute for BIO 3422.) Generally offered: Fall, Spring, Summer. Differential Tuition: $100. Course Fees: DL01 $50; IUB1 $10; L001 $30.

BIO 3433. Neurobiology. (3-0) 3 Credit Hours. 
Prerequisite: BIO 1414. Anatomy and physiology of nervous systems; the mechanisms of neuronal functions. Generally offered: Fall, Spring. Differential Tuition: $150.

BIO 3442. Neurobiology Laboratory. (0-4) 2 Credit Hours. 
Prerequisite: BIO 1414 and completion of or concurrent enrollment in BIO 3433. A laboratory course emphasizing principles presented in BIO 3433. Generally offered: Fall, Spring. Differential Tuition: $100. Course Fees: IUB1 $10; L001 $30.

BIO 3453. Neuroscience and Our Future. (3-0) 3 Credit Hours. 
Prerequisite: BIO 2313. A discussion of the implications of recent Neuroscience discoveries. Students will use available literature and their own powers of reason to separate fact from fantasy, and determine what future applications of Neuroscience may be possible. Generally offered: Spring. Differential Tuition: $150.

BIO 3513. Biochemistry. (3-0) 3 Credit Hours. 
Prerequisites: BIO 2313 and CHE 3643. Introduction to biochemistry. amino acids, protein structure, enzymes, lipids, metabolism, nucleic acid structure, bioenergetics, and carbohydrates. (Credit cannot be earned for both BIO 3513 and CHE 4303.) Generally offered: Fall, Spring, Summer. Differential Tuition: $150.

BIO 3522. Biochemistry Laboratory. (1-4) 2 Credit Hours. 
Prerequisites: BIO 2313, CHE 2603, CHE 2612, and completion of or concurrent enrollment in BIO 3513. Basic biochemical laboratory techniques: Protein assay, centrifugation, protein purification, chromatography, electrophoresis, western blotting, and enzyme kinetics. This laboratory includes an online component. (Credit cannot be earned for both BIO 3522 and BIO 3362.) Generally offered: Fall, Spring, Summer. Differential Tuition: $100. Course Fees: DL01 $50; IUB1 $10; L001 $30.

BIO 3623. Neuropsychopharmacology. (3-0) 3 Credit Hours. 
Prerequisite: BIO 2313. BIO 3433 is recommended. A study of the pharmacology of drugs that affect the function of the central nervous system. Topics include drug-receptor interactions, drugs of abuse, and drugs used to treat mental illness. Generally offered: Fall. Differential Tuition: $150.

BIO 3663. Human Embryology. (3-0) 3 Credit Hours. 
Prerequisite: BIO 2313. Development of the human embryo from fertilization to the birth of the fetus. The origin of various tissues and organs will be followed during development. Environmental and genetic factors that can alter development will be discussed. Generally offered: Fall. Differential Tuition: $150.

BIO 3713. Microbiology. (3-0) 3 Credit Hours. 
Prerequisite: BIO 1414. Concurrent enrollment in BIO 2313 and BIO 3722 is recommended. A comprehensive study of microorganisms, including their composition, morphology, growth, metabolism, classification, ecology, and significance in disease. (BIO 1053 cannot substitute for BIO 3713. Credit cannot be earned for both BIO 3713 and ES 3103.) Generally offered: Fall, Spring, Summer. Differential Tuition: $150.
BIO 3722. Microbiology Laboratory. (0-6) 2 Credit Hours.
Prerequisites: BIO 1414, and completion of or concurrent enrollment in BIO 3713. Basic microbiology techniques with emphasis on microscopy; cell staining and characterization; species isolation techniques; bacterial cultivation, nutrition, and physical requirements; and the physical and chemical control of microbes. Immunodeficient and pregnant students must contact the Coordinator, Microbiology Teaching Labs, for additional instructions prior to the class start date. (BIO 1061 cannot substitute for BIO 3722. Credit cannot be earned for both BIO 3722 and ES 3112.) Generally offered: Fall, Spring, Summer. Differential Tuition: $100. Course Fees: IUB1 $10; L001 $30.

BIO 3743. Bacteriology. (3-0) 3 Credit Hours.
Prerequisite: BIO 2313 and BIO 3713. BIO 3722 is recommended. A study of the phylogeny of prokaryotes; structure and function of prokaryotic cells; ecology and physiological diversity of prokaryotes; growth and control of microorganisms; genetics of bacteria and bacteriophages; bacteria as agents of disease; antibacterials and other chemotherapeutics; human applications of microbiology; microbial genomics and principles of microbial biotechnology. Generally offered: Fall. Differential Tuition: $150.

BIO 3813. Cell Biology. (3-0) 3 Credit Hours.
Prerequisite: BIO 2313 and BIO 3513 is recommended. A study of cellular molecules and metabolic processes; synthesis and regulation of macromolecules; differential gene expression; membranes and organelles; cytoskeleton; cell cycle and growth of normal and neoplastic cells. (Credit cannot be earned for both BIO 3813 and BME 3114.) Generally offered: Fall, Spring, Summer. Differential Tuition: $150.

BIO 3822. Cell Biology Laboratory. (1-4) 2 Credit Hours.
Prerequisites: BIO 2313 and either BIO 2362 or CHE 1131, and completion of or concurrent enrollment in BIO 3813. A study of the microscopic, biochemical and molecular approaches used to investigate cellular structure and function, including the principles involved in the techniques, their practical application, and analysis of the data generated. This laboratory includes an online component. (Credit cannot be earned for both BIO 3822 and either of the following: BIO 3362 or BME 3114.) Generally offered: Fall, Spring, Summer. Differential Tuition: $100. Course Fees: DL01 $50; IUB1 $10; L001 $30.

BIO 3913. Molecular Biology. (3-0) 3 Credit Hours.
Prerequisite: BIO 2313; BIO 3513 is recommended. A study of nucleotides, DNA, replication, recombination, RNA, transcription, genetic code, translation, genomes, and chromosomes. Generally offered: Fall, Spring. Differential Tuition: $150.

BIO 3933. Principles of Cancer Biology. (3-0) 3 Credit Hours.
Prerequisite: BIO 2313. BIO 3813 is recommended. A study of the underlying molecular and cellular biology involved in carcinogenesis, the roles of oncogenes and tumor suppressor genes in cancer development and progression, and modern technologies in cancer screening, diagnosis, treatments and prevention. Upon completion of the class, students should have gained a basic understanding of the mechanisms by which tumors arise and progress to cancer, potential therapeutic targets in cancer treatments, and an individual’s actions that are expected to decrease the chances of cancer development. Generally offered: Fall. Spring. Differential Tuition $150.

BIO 4033. Conservation Biology. (3-0) 3 Credit Hours.
Prerequisite: BIO 2313 and BIO 3283. The class topics will include studying the nature of the biosphere, threats to its integrity, and ecologically sound responses to these threats. Also included will be the origin and preservation of biotic diversity, how the rich variety of plant and animal life around us arose, how it has been maintained by natural processes, and how we can prevent its destruction. (Same as ES 4213. Credit cannot be earned for both BIO 4033 and ES 4213.) Generally offered: Fall. Differential Tuition: $150.

BIO 4043. Desert Biology. (2-3) 3 Credit Hours.
Prerequisite: BIO 2313 and junior or senior status: a minimum of 60 semester credit hours, or consent of instructor. A study of the deserts of the world with an emphasis on U.S. deserts. Adaptations of plants and animals and their responses to desert conditions, as well as examinations of desert climatic patterns, geology, and natural history. Lecture, laboratory, and fieldwork will be included. (Same as ES 4123. Credit cannot be earned for both BIO 4043 and ES 4123.) Generally offered: Summer. Spring. Differential Tuition $150.

BIO 4053. Wildlife Biology. (3-0) 3 Credit Hours.
Prerequisite: BIO 2313 and BIO 3283. An introduction to wildlife biology and management including ecological principles dealing with ecosystems, natural communities, and populations. The importance of animal behavior, the availability of food, cover, wildlife diseases, predators, hunting, and trapping will be included. Field studies will allow students to observe and apply classroom topics. (Same as ES 4243. Credit cannot be earned for both BIO 4053 and ES 4243.) Generally offered: Fall. Differential Tuition: $150.

BIO 4063. Ornithology. (3-0) 3 Credit Hours.
Prerequisite: BIO 2313. A course covering various aspects of the biology of birds, including anatomy, physiology, systematics, evolution, behavior, ecology, and biogeography. Field trips will be included. (Same as ES 3163. Credit cannot be earned for both BIO 4063 and ES 3163.) Generally offered: Spring. Spring. Differential Tuition $150.

BIO 4143. Developmental Biology. (3-0) 3 Credit Hours.
Prerequisite: BIO 2313; BIO 3813 is recommended. Overview of developmental biology focusing on the origins of classical concepts as well as modern molecular approaches. Emphasis will be placed on the mechanisms underlying developmental processes using both invertebrate and vertebrate examples. Subjects include axis formation, induction, morphogenesis, embryonic pattern formation, cell differentiation, and organogenesis. (Formerly BIO 3143. Credit cannot be earned for both BIO 4143 and BIO 3143.) Generally offered: Fall. Differential Tuition: $150.

BIO 4233. Field Biology. (3-0) 3 Credit Hours.
Prerequisite: BIO 2313 and junior or senior status: a minimum of 60 semester credit hours, or consent of instructor. Concurrent enrollment in BIO 4241 is recommended. A study of the natural history of plants and animals in their native environment. Techniques for the identification of birds, mammals, reptiles, amphibians, insects, and the dominant flowering plants will be discussed. (Same as ES 4113. Credit cannot be earned for both BIO 4233 and ES 4113.) Generally offered: Summer. Spring. Differential Tuition $150.
BIO 4241. Field Biology Laboratory. (0-3) 1 Credit Hour.
Prerequisite: BIO 2313 and junior or senior status: a minimum of 60 semester credit hours, or consent of instructor. Concurrent enrollment in BIO 4233 is recommended. A field-oriented course offering the opportunity for practical experience observing, collecting, and identifying Texas plants and animals. (Same as ES 4111. Credit cannot be earned for both BIO 4241 and ES 4111.) Generally offered: Summer. Differential Tuition $50. Course Fees: IUB1 $10; L001 $30.

BIO 4453. Endocrinology. (3-0) 3 Credit Hours.
Prerequisite: BIO 2313. Molecular, cellular and physiological effects of hormones in health and disease. Topics include molecular mechanisms of hormone action in reproductive physiology, growth and development as well as defects in hormonal regulation underlying clinically important syndromes (e.g., diabetes, hypertension, osteoporosis and cancer). Generally offered: Fall. Differential Tuition $150.

BIO 4473. Advanced Clinical Medicine and Pathology. (3-0) 3 Credit Hours.
Prerequisite: BIO 2313. Molecular, cellular and physiological effects of hormones in health and disease. Topics include molecular mechanisms of hormone action in reproductive physiology, growth and development as well as defects in hormonal regulation underlying clinically important syndromes (e.g., diabetes, hypertension, osteoporosis and cancer). Generally offered: Summer. Differential Tuition $100. Course Fees: IUB1 $10; L001 $30.

BIO 4483. Medical Mycology. (3-0) 3 Credit Hours.

BIO 4583. The Computational Brain. (3-0) 3 Credit Hours.
Prerequisite: BIO 2313 and BIO 3433. Principles of cellular neurophysiology and neuroanatomy are used to explore the computational operations performed by neurons and networks of neurons. Generally offered: Spring. Differential Tuition $150.

BIO 4643. Medicinal Plants. (3-0) 3 Credit Hours.
Prerequisite: BIO 2313; BIO 3513 is recommended. Ethnobotanical, biochemical and pharmacological aspects of some of our most important plant-derived drugs. Generally offered: Fall. Differential Tuition: $150.

BIO 4723. Virology. (3-0) 3 Credit Hours.
Prerequisites: BIO 2313 and BIO 3513. Introduction to the molecular, genetic, and biological properties of viruses. Course will cover the basic concepts of virus structure, replication, virus/host interactions, pathogenesis, and evolution. Generally offered: Fall. Differential Tuition: $150.

BIO 4743. Immunology. (3-0) 3 Credit Hours.
Prerequisite: BIO 2313. Concurrent enrollment in BIO 4752 is recommended. A study of the properties of antigens and antibodies and current concepts of humoral and cell-mediated immunity and the cells involved. Generally offered: Fall, Spring, Summer. Differential Tuition: $150.

BIO 4752. Immunology Laboratory. (0-4) 2 Credit Hours.
Prerequisites: BIO 2313, BIO 2362 (or BIO 2322 in previous catalogs), and completion or concurrent enrollment in BIO 4743. Laboratory applications of principles presented in BIO 4743. (Formerly BIO 4751. Credit cannot be earned for both BIO 4751 and BIO 4752.) Generally offered: Fall, Spring, Summer. Differential Tuition: $100. Course Fees: IUB1 $10; L001 $30.

BIO 4763. Parasitology. (3-0) 3 Credit Hours.
Prerequisite: BIO 2313. BIO 3713 is strongly recommended. This course is focused on eukaryotic parasites of medical or veterinary importance: their life cycles, epidemiology, control, and the diseases and pathology they cause. Evolutionary aspects of host-parasite interactions, the diversity of parasite biology, and the interrelationships between parasitology, vector biology, and public health will be emphasized. Generally offered: Spring. Differential Tuition $150.

BIO 4783. Microbial Genetics and Physiology. (3-0) 3 Credit Hours.

BIO 4813. Brain and Behavior. (3-0) 3 Credit Hours.
Prerequisite: BIO 2313. This course explores the brain basis of behavior, with a focus on understanding the neurophysiological, neurochemical and neuroanatomical underpinnings for a variety of simple and complex behaviors. Students will explore topics such as sensation and perception, pain, movement, sleep, biological rhythms, emotions, addiction, learning and memory, and neurodevelopment. The topics are grounded with examples of typical human behavior and disorders, such as Parkinson’s disease, Autism, Schizophrenia and psychopathology. (Credit cannot be earned for both BIO 4813 and PSY 4183.) Generally offered: Fall. Differential Tuition $150.

BIO 4823. Cognitive Neuroscience. (3-0) 3 Credit Hours.
Prerequisite: BIO 2313 and BIO 3433 or BIO 4813 or PSY 4183 or consent of instructor. The biological basis of cognition, including perception, attention, learning, memory, emotion, language, and executive function. The course introduces students to the use of human neuroimaging experiments and clinical population, as well as research with other species, to study the brain basis of complex behavior and cognitive disorders, such as memory loss, language impairment and developmental disorders. Generally offered: Spring. Differential Tuition $150.

BIO 4842. Clinical Gross Anatomy. (0-6) 2 Credit Hours.
Prerequisite: This course is only open to students participating in the Biology Pre-Medical Sciences Concentration. It will examine the anatomical/functional relationship of the human body, with special emphasis given to the different professional tracks (medical, pharmacy, dental and veterinarian). The course will encompass student presentations, discussion groups, online research, and demonstrations with models and use of the synthetic cadaver, in addition to lectures and dissection. Imaging techniques including CT scans, MRI, and x-ray radiography will be used to introduce the student to the clinical perspective, as well as a review of the histology of tissues both in health and diseased conditions. Generally offered: Fall. Differential Tuition: $100. Course Fees: IUB1 $10; L001 $30.

BIO 4911. Independent Study. (0-0) 1 Credit Hour.
Prerequisite: Permission in writing (form available) from the instructor, an undergraduate academic advisor, the Department Chair, and the Dean of the College in which the course is offered. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but no more than 6 semester credit hours, regardless of discipline, will apply to a bachelor’s degree. Only 6 semester credit hours of BIO 3043, BIO 4911-3, BIO 4923 and BIO 4993, in any combination, can be taken as BIO electives. Additional research hours of these courses (excluding Independent Study) may be taken as free electives, for a maximum of 12 research hours being applied to the bachelor’s degree. Generally offered: Fall, Spring, Summer. Differential Tuition: $50.
BIO 4912. Independent Study. (0-0) 2 Credit Hours.
Prerequisite: Permission in writing (form available) from the instructor, an undergraduate academic advisor, the Department Chair, and the Dean of the College in which the course is offered. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but no more than 6 semester credit hours, regardless of discipline, will apply to a bachelor's degree. Only 6 semester credit hours of BIO 3043, BIO 4911-3, BIO 4923 and BIO 4993, in any combination, can be taken as BIO electives. Additional research hours of these courses (excluding Independent Study) may be taken as free electives, for a maximum of 12 research hours being applied to the bachelor's degree. Generally offered: Fall, Spring, Summer. Differential Tuition: $100.

BIO 4913. Independent Study. (0-0) 3 Credit Hours.
Prerequisite: Permission in writing (form available) from the instructor, an undergraduate academic advisor, the Department Chair, and the Dean of the College in which the course is offered. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but no more than 6 semester credit hours, regardless of discipline, will apply to a bachelor's degree. Only 6 semester credit hours of BIO 3043, BIO 4911-3, BIO 4923 and BIO 4993, in any combination, can be taken as BIO electives. Additional research hours of these courses (excluding Independent Study) may be taken as free electives, for a maximum of 12 research hours being applied to the bachelor's degree. Generally offered: Fall, Spring, Summer. Differential Tuition: $150.

BIO 4923. Laboratory Research: Biology Concentrations. (0-0) 3 Credit Hours.
Permission in writing (form available in the Biology Department Office) from the faculty mentor, the student's advisor, the Department Chair, and the Dean of the College. Supervised laboratory research mentored by a faculty member engaged in active research within the student's designated area of concentration. May be repeated for credit, but no more than 6 semester credit hours will apply to a bachelor's degree. Only 6 semester credit hours of BIO 3043, BIO 4911-3, BIO 4923 and BIO 4993, in any combination, can be taken as BIO electives. Additional research hours of these courses (excluding Independent Study) may be taken as free electives, for a maximum of 12 research hours being applied to the bachelor's degree. Generally offered: Fall, Spring, Summer. Differential Tuition: $150.

BIO 4951. Special Studies in Biology. (1-0) 1 Credit Hour.
An organized course offering the opportunity for specialized study not normally or not often available as part of the regular course offerings. Special Studies may be repeated for credit when the topics vary, but not more than 6 semester credit hours, regardless of discipline, will apply to a bachelor's degree. No more than 6 semester credit hours of BIO 2953, BIO 4951, or BIO 4953 can be applied to a B.S. degree in Biology or Microbiology and Immunology. Differential Tuition: $50.

BIO 4953. Special Studies in Biology. (3-0) 3 Credit Hours.
An organized course offering the opportunity for specialized study not normally or not often available as part of the regular course offerings. Special Studies may be repeated for credit when the topics vary, but not more than 6 semester credit hours, regardless of discipline, will apply to a bachelor's degree. No more than 6 semester hours of BIO 2953, BIO 4951, or BIO 4953 can be applied to a B.S. degree in Biology or Microbiology and Immunology. Generally offered: Fall, Spring, Summer. Differential Tuition: $150.

BIO 4981. Senior Seminar in Microbiology and Immunology. (1-0) 1 Credit Hour.
Prerequisite: Senior status, a minimum of 90 semester credit hours. This course is only open to seniors in the Microbiology and Immunology degree program. Students will learn how to interpret the scientific literature and to organize and present scientific research findings as reported in the current literature. May be repeated for credit. The grade report for the course is either "CR" (satisfactory performance) or "NC" (unsatisfactory performance). Generally offered: Fall, Spring. Course Fees: LRS1 $5; STSI $5.

BIO 4993. Honors Research. (0-0) 3 Credit Hours.
Enrollment limited to biology majors who are members of the Honors College or who are pursuing College of Sciences Honors, and who are in their last two semesters of study. Approval by the Honors College or College Honors Committee is required. Supervised research and preparation of an Honors Thesis. May be repeated for credit with approval, but no more than 6 semester credit hours, regardless of discipline, will apply to a bachelor's degree. Only 6 semester credit hours of BIO 4911-3, BIO 4923 and BIO 4993, in any combination, can be taken as BIO electives. Additional research hours of these courses (excluding Independent Study) may be taken as free electives, for a maximum of 12 research hours being applied to the bachelor's degree. Generally offered: Fall, Spring. Differential Tuition: $150.