

# Biology

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## Undergraduate Degrees

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- [Minor in Biology](http://catalog.uta.edu/science/biology/undergraduate/#minortext) (<http://catalog.uta.edu/science/biology/undergraduate/#minortext>)

## Graduate Degrees

- [Biology, M.S.](http://catalog.uta.edu/science/biology/graduate/#masterstext) (<http://catalog.uta.edu/science/biology/graduate/#masterstext>)
- [Quantitative Biology, B.S. to Ph.D.](http://catalog.uta.edu/science/biology/graduate/#doctoraltext) (<http://catalog.uta.edu/science/biology/graduate/#doctoraltext>)
- [Quantitative Biology, Ph.D.](http://catalog.uta.edu/science/biology/graduate/#doctoraltext) (<http://catalog.uta.edu/science/biology/graduate/#doctoraltext>)

## COURSES

### **BIOL 1301. NUTRITION. 3 Hours. (TCCN = BIOL 1322)**

Nutrients essential to an adequate diet and good health and the nutritive values of common foods are reviewed. Offered as BIOL 1301 and HEED 1301: credit will be granted for only one of these courses. Students seeking certification in Health Education must enroll in HEED 1301. Students seeking credit toward their science requirement must enroll in BIOL 1301. May not be used for biology grade point calculation or biology credit toward a BS degree in biology, microbiology, or medical technology.

### **BIOL 1333. BIOLOGY FOR NON-SCIENCE MAJORS: CELLS AND DISEASE. 3 Hours. (TCCN = BIOL 1306)**

Scientific literacy is crucial for navigating health-related issues in today's society. In this lecture and lab course, non-science majors will learn about the molecules of life, the cell, energy and metabolism, cell division, genetics and inheritance and diseases, such as cancer and diabetes. This course will satisfy the laboratory science requirements for students in the Colleges of Liberal Arts and Business Administration, and in the School of Social Work. Formerly listed as BIOL 1433, credit will not be given for both.

### **BIOL 1334. BIOLOGY FOR NON-SCIENCE MAJORS: LIFE ON EARTH. 3 Hours. (TCCN = BIOL 1307)**

Scientific literacy is crucial for understanding the natural world and our relationship to it. In this lecture and lab course, non-science majors will learn about biologically-based problems facing today's society. Course themes include evolution, antibiotic resistance, genetic diversity, animal and bacterial and plant diversity, ecosystems, ecology and global change. This course will satisfy the laboratory science requirements for students in the Colleges of Liberal Arts and Business Administration, and in the School of Social Work. Formerly listed as BIOL 1434, credit will not be given for both.

### **BIOL 1345. BIOLOGY I FOR NURSING STUDENTS. 3 Hours.**

This course focuses on the chemical and molecular basis of life, including metabolism, cell structure and function, and genetics to provide knowledge of these subjects for those pursuing a degree in nursing or public health. Note: This course cannot be applied for credit toward a degree in Biology.

### **BIOL 1441. BIOLOGY I FOR SCIENCE MAJORS: CELL AND MOLECULAR BIOLOGY. 4 Hours. (TCCN = BIOL 1406)**

(BIOL 1406) This course focuses on the chemical and molecular basis of life, including metabolism, cell structure and function, and genetics. Laboratory experiments are designed to complement theory presented in lecture. Formerly listed as BIOL 1449; credit will not be given for both.

### **BIOL 1442. BIOLOGY II FOR SCIENCE MAJORS: ECOLOGY AND EVOLUTION. 4 Hours. (TCCN = BIOL 1407)**

Reviews significant aspects of organismal biology and presents current hypotheses concerning the origin and diversification of life on earth. The ecological and behavioral interactions between organisms and their biotic/abiotic environments are considered from an evolutionary perspective. The laboratory will examine evolution, ecology and the diversity of life using hands-on observational and experimental approaches. Prerequisite: BIOL 1441.

### **BIOL 2300. BIostatistics. 3 Hours.**

Introduction to the collection, description, and analysis of data with statistical methods appropriate for biological sciences. Specific topics covered include but are not limited to: descriptive statistics, frequency distributions, random sampling, probabilities, binomial distribution, normal distribution theory and calculations, confidence intervals, t-tests (independent sample and paired designs), Chi-square tests (one-way and two-way analysis), analysis of variance, correlation and linear regression. Prerequisite: BIOL 1441 and BIOL 1442, or permission of the instructor.

### **BIOL 2317. BASIC CONCEPTS IN HUMAN SEXUALITY. 3 Hours.**

The physiological, psychological, and sociological aspects of human sexuality. Offered as BIOL 2317, HEED 2317, PSYC 2317, and GWSS 2317. Credit will be granted for one of these courses only. Students seeking certification in Health Education must enroll in HEED 2317. Students seeking credit toward their science requirement must enroll in BIOL 2317. May not be used for biology grade point calculation or biology credit toward a BS degree in biology, microbiology, medical technology, psychology, or sociology.

**BIOL 2444. GENERAL MICROBIOLOGY. 4 Hours.**

Fundamental principles of microbiology including the structure and function of microbial cells and their activities in nature. Bacteria will be used in the laboratory to provide training and experimental methodology. Formerly listed as BIOL 3444; credit will not be granted for both. Prerequisite: BIOL 1441, CHEM 1441 or CHEM 1341.

**BIOL 2457. HUMAN ANATOMY AND PHYSIOLOGY I. 4 Hours. (TCCN = BIOL 2401)**

Functional morphology of humans, cellular function, principles of support and movement, and neural control systems. Laboratory exercises involve both anatomical and physiological aspects of principles introduced in the lecture. This class is designed for students in sport activities (EXSA), nursing, and health. Prerequisite: BIOL 1345 or BIOL 1441 or equivalent, or approval of the department. May not be used for biology grade point calculation or biology credit toward a degree in biology or microbiology.

**BIOL 2458. HUMAN ANATOMY AND PHYSIOLOGY II. 4 Hours. (TCCN = BIOL 2402)**

Functional morphology of humans, maintenance of the human body, and continuity of life. Topics will include the endocrine, cardiovascular, respiratory, digestive, urinary, immune, and reproductive systems. Laboratory exercises explore both anatomical and physiological aspects of principles introduced in the lecture. This class is designed for students in sport activities (EXSA), nursing, and health. Prerequisite: BIOL 2457 or equivalent. May not be used for biology grade point calculation or biology credit toward a degree in biology or microbiology.

**BIOL 2460. NURSING MICROBIOLOGY. 4 Hours.**

The intention of this course is to present basic information, relevant to nursing practice, with the principles of microbiology and the nature of microbial disease. This course will give the student a fundamental background of knowledge that will be applicable to the care of infectious patients, to the control of microbial diseases, and an understanding of microorganisms. The laboratory will provide practice in aseptic techniques, the use of disinfectants and antimicrobial agents, and microscopic study of bacteria. This course cannot be applied for credit toward a degree in Biology. Prerequisite: BIOL 1345, or BIOL 1441 or equivalent.

**BIOL 3101. CURRENT TOPICS IN BIOLOGY. 1 Hour.**

Seminar on significant topics and issues in modern biology. Students will attend seminars on selected topics. Topics will vary each semester. May be repeated once for biology credit.

**BIOL 3131. SERVICE LEARNING. 1 Hour.**

Service learning is a credit-bearing learning experience; therefore, credit is awarded for academic learning and not for service hours. Students engage in classroom activities, assignments, and discussions and in addition, integrate course content and learning outcomes with genuine community needs or issues. Collaborations with the community result in relationship-building and partnerships through intentional, structured service experiences. Students are required to analyze and evaluate these experiences by engaging in reflective activities, such as discussion and journaling. This process of structured service and learning in the community promote a sense of civic responsibility and commitment to others. Students commit to serve weekly time resulting in at least fifteen hours during one semester. This time is agreed upon by student, faculty, and community agency. Prerequisite: Permission of the Instructor.

**BIOL 3149. COOPERATIVE PROGRAM IN BIOLOGY. 1 Hour.**

The purpose of this course is to allow students to earn college credit for relevant field work in the areas of biology and microbiology. Students must apply for the program and be cleared for registration during the semester prior to enrollment.

**BIOL 3231. SERVICE LEARNING. 2 Hours.**

Service learning is a credit-bearing learning experience; therefore, credit is awarded for academic learning and not for service hours. Students engage in classroom activities, assignments, and discussions and in addition, integrate course content and learning outcomes with genuine community needs or issues. Collaborations with the community result in relationship-building and partnerships through intentional, structured service experiences. Students are required to analyze and evaluate these experiences by engaging in reflective activities, such as discussion and journaling. This process of structured service and learning in the community promote a sense of civic responsibility and commitment to others. Students commit to serve weekly time resulting in at least fifteen hours during one semester. This time is agreed upon by student, faculty, and community agency. Prerequisite: Permission of the Instructor.

**BIOL 3249. COOPERATIVE PROGRAM IN BIOLOGY. 2 Hours.**

The purpose of this course is to allow students to earn college credit for relevant field work in the areas of biology and microbiology. Students must apply for the program and be cleared for registration during the semester prior to enrollment.

**BIOL 3301. CELL PHYSIOLOGY. 3 Hours.**

An introduction to the basic physical, chemical, and biological principles which govern function in eukaryotic cells, and the relationships between cells and their environments. Prerequisite: BIOL 1441. CHEM 2181 and CHEM 2321 are recommended.

**BIOL 3302. UNDERGRADUATE RESEARCH EXPERIENCE. 3 Hours.**

In this laboratory course, students will learn core concepts in Biology through an intense research experience. Students will master skills including quantitative data analysis, oral and written communication, and critical thinking. Permission is required to enroll in this course.

**BIOL 3303. DRUGS AND BEHAVIOR. 3 Hours.**

A survey of the psychoactive agents, their therapeutic uses, and social abuses. Alcohol, nicotine, caffeine, narcotics, hallucinogens, stimulants, and tranquilizers. Offered as BIOL 3303, HEED 3303, and PSYC 3303; credit will be granted only once. May not be used for biology grade point calculation or biology credit toward a B.S. degree in biology, microbiology, or medical technology. Students seeking certification in health education must enroll in HEED 3303.

**BIOL 3304. MICROBIAL GENETICS. 3 Hours.**

Consideration of the physical, chemical, and functional nature of genetic processes in micro-organisms. Prerequisite: BIOL 2444, or permission of instructor.

**BIOL 3306. BACTERIAL PHYSIOLOGY AND ANTIBIOTICS. 3 Hours.**

This course will cover the fundamentals of how bacterial cells work, and how antibiotics interfere with essential functions to stop bacterial cells from working. This class is taught largely through reading and discussion of the primary literature, and with active learning and writing assignments.

Prerequisite: BIOL 2444.

**BIOL 3307. EVOLUTIONARY MEDICINE. 3 Hours.**

The application of evolutionary theory to the practice of medicine from an anthropological perspective. Topics include diet/paleodiets, sleep habits, infectious diseases, the developmental origins of health and disease, mental health, women's health and reproduction, and aging/senescence, among others. Offered as BIOL 3307 and ANTH 3307; credit will only be granted in one department.

**BIOL 3308. MICROBIAL ECOLOGY AND EVOLUTION. 3 Hours.**

The diversity, ecology and evolution of microorganisms in natural systems. Topics will include the role of bacteria and fungi in the functioning of terrestrial ecosystems; microbial biogeography; taxonomic and metabolic diversity; evolutionary diversification; and interactions among microbes and with plant and animal hosts. Prerequisite: BIOL 2444.

**BIOL 3310. SELECTED TOPICS IN BIOLOGY. 3 Hours.**

Topics in biology not treated in the regular curriculum. Topic, format, and prerequisites to be determined by the instructor. May be repeated for biology elective credit as different topics are offered. Prerequisite: BIOL 1441, BIOL 1442.

**BIOL 3311. SELECTED TOPICS IN MICROBIOLOGY. 3 Hours.**

Topics in microbiology not treated in the regular curriculum. Topic, format, and prerequisites to be determined by the instructor. May be repeated for microbiology elective credit as different topics are offered. Prerequisite: BIOL 1441, BIOL 2444.

**BIOL 3312. IMMUNOLOGY. 3 Hours.**

An introduction to the components, properties, and manifestations of the adaptive immune response that occurs in vertebrates. Prerequisite: BIOL 1441, BIOL 2444. CHEM 2181, CHEM 2321 are recommended.

**BIOL 3313. HUMAN ADAPTATION AND THE CONCEPT OF RACE. 3 Hours.**

The study of modern human biological variation in the context of the history of the concept of race. Detailed historical review explores changing perspectives on variation within our species. Course examines physiological adaptations to environmental stress among a variety of human populations and implications of recent genetic research. Offered as BIOL 3313 and ANTH 3311; credit will only be granted in one department.

**BIOL 3314. PRIMATE EVOLUTION AND BEHAVIOR. 3 Hours.**

An overview of the Primate Order covering primate origins, evolution, ecology, adaptation, and behavior. Examination of the environmental context within which primates live, how the form of their bodies reflects their activities, and how they relate behaviorally to their environments and to one another. Offered as BIOL 3314 and ANTH 3313; credit will only be granted in one department.

**BIOL 3315. GENETICS. 3 Hours.**

Principles of molecular and classical genetics. The function and transmission of hereditary material in microorganisms, plants, and animals, including humans. Prerequisite: BIOL 1441.

**BIOL 3316. ASTROBIOLOGY I. 3 Hours.**

This is an interdisciplinary course between astrophysics, biology and geology. Topics include properties of life, origin and evolution of life on Earth, terrestrial geology and habitability, environmental forcings, extremophiles, mass extinctions, meteorites, searches for life in the solar system. Offered as BIOL 3316, GEOL 3316 and PHYS 3316; credit will be granted only once. Prerequisite: PHYS 1441 & PHYS 1442 or equivalent and PHYS 2315 or PHYS 3315, or permission from instructor. Prerequisites for Biology majors: PHYS 1441 & PHYS 1442 or equivalent.

**BIOL 3317. GENOMICS. 3 Hours.**

This course presents an integrative approach to genome science, combining elements of genetics, state of the art technologies in genomic analysis. A basic knowledge of genetics and probability concepts is required. Use of the World Wide Web will be an essential part of the course. Prerequisite: BIOL 3315 or permission of instructor.

**BIOL 3318. LIMNOLOGY. 3 Hours.**

The living and nonliving components of inland waters. An introduction to the geological, physical, and chemical background, and to the major organisms and ecological processes. Prerequisite: BIOL 1441.

**BIOL 3319. HUMAN GENETICS. 3 Hours.**

This course will enable students to comprehend the basic principles of genetics applied to human inheritance and disease, to interpret the research strategies aimed to identify and study the genes responsible for diverse functions and traits, as well as to assess the consequences of the genetic technologies in our society. Prerequisites: BIOL 1441 and BIOL 3315.

**BIOL 3320. BIOLOGY OF TEXAS. 3 Hours.**

This course is an introduction to habitat diversity and the number of species found in the state of Texas. Students will learn about the physical, climatological, and human geography of Texas and how that affects animal and plant life within the state. Descriptions of state and federal endangered species listing processes will also be covered. Prerequisite: BIOL 1441 and BIOL 1442.

**BIOL 3321. INFECTIOUS DISEASE. 3 Hours.**

This course will cover key concepts that relate to the history and background of infectious diseases, as well as the emergence, spread, and control of infectious disease epidemics. Vaccination, antibiotic resistance, and eradication of diseases will also be discussed. Prerequisite: BIOL 3444.

**BIOL 3322. BRAIN AND BEHAVIOR. 3 Hours.**

An introduction to the anatomical structures and physiological processes that determine behavior. Topics include the acquisition and processing of sensory information, the neural control of movement, and the biological bases of complex behaviors (such as learning, memory, sex, language, and addiction), as well as the basic functioning of the nervous system. Offered as BIOL 3322 and PSYC 3322. Credit will be granted only once. BIOL 3322 prerequisite: BIOL 1441, BIOL 1442. PSYC 3322 prerequisite: BIOL 1441 or PSYC 1315.

**BIOL 3324. HUMAN ECOLOGY OF FOOD. 3 Hours.**

Modern food production and consumption is a complex, interdisciplinary topic directly relevant to global environmental and public health issues. This course will examine our place in the food web from ecological, biogeographical, historical, cultural, and sociopolitical perspectives. Course participants will examine the implications of our everyday decisions as consumers who play a key role in an intricate ecological system. Prerequisite: BIOL 1441 and BIOL 1442.

**BIOL 3326. ANIMAL BEHAVIOR. 3 Hours.**

A survey of research and theory comparing behavior at various phyletic levels. Offered as BIOL 3326 and PSYC 3326. Credit will be granted for only one of these courses. Prerequisite: BIOL 1441, BIOL 1442.

**BIOL 3327. MICROBIAL DIVERSITY. 3 Hours.**

This course is an introduction to the great diversity of microbial life. The topic material explores this diversity by considering the great age of bacteria, their evolution, biochemistry, habitat and form. The course of study focuses attention on organisms not commonly encountered in General Microbiology laboratories. Prerequisite: BIOL 3444 Microbiology.

**BIOL 3328. ENVIRONMENTAL MICROBIOLOGY. 3 Hours.**

An introduction to the principles, methodology, and practical applications and implications of environmental microbiology. Lecture topics include habitat and community approaches to environmental microbiology, measures of microbial populations and activities, interactions among microbial communities, the role of microorganisms in the origin of mineral resources, microorganisms and pollution, and current developments on energy flow through microbial communities. Prerequisite: BIOL 3444.

**BIOL 3331. SERVICE LEARNING. 3 Hours.**

Service learning is a credit-bearing learning experience; therefore, credit is awarded for academic learning and not for service hours. Students engage in classroom activities, assignments, and discussions and in addition, integrate course content and learning outcomes with genuine community needs or issues. Collaborations with the community result in relationship-building and partnerships through intentional, structured service experiences. Students are required to analyze and evaluate these experiences by engaging in reflective activities, such as discussion and journaling. This process of structured service and learning in the community promote a sense of civic responsibility and commitment to others. Students commit to serve weekly time resulting in at least fifteen hours during one semester. This time is agreed upon by student, faculty, and community agency. Prerequisite: Permission of the Instructor.

**BIOL 3333. GLOBAL CHANGE BIOLOGY. 3 Hours.**

This course covers global-scale environmental changes and their consequences for species and ecological communities. We will focus on climate change, habitat loss, and species invasion, with special emphasis on combining physiology, ecology, and evolution to understand past responses and predict future outcomes. Prerequisite: BIOL 1442.

**BIOL 3339. INTRODUCTION TO EVOLUTION. 3 Hours.**

The goals of this course are: to introduce students to the process of evolution, the patterns that result, and the way that evolutionary history has shaped the diversity of organisms on Earth; to explore how evolutionary biologists formulate and test hypotheses; to investigate applications of evolutionary biology to mainstream medical research; and to investigate current controversies in evolutionary biology. Prerequisites: BIOL 1441 and BIOL 3315 (or equivalent), or permission of instructor.

**BIOL 3340. BIOINFORMATICS. 3 Hours.**

This course is an applied introduction to bioinformatics and computational genomics. The course is geared toward the student with a biology background and limited programming experience. The course provides an entrance to commonly used programming/scripting languages and an introduction to numerous aspects of modern genomic data analyses (e.g. identification of coding and regulatory features in novel sequences, expression analysis, and comparative/phylogenetic analyses). Prerequisite: BIOL 1442 and BIOL 3315, or permission of instructor.

**BIOL 3342. DEVELOPMENTAL BIOLOGY IN HEALTH AND DISEASE. 3 Hours.**

An introduction to fundamental developmental events that form complex organisms with an emphasis on human health and disease. Prerequisites: BIOL 1441 and 1442. BIOL 3301 is recommended.

**BIOL 3348. PRE-MEDICAL PRECEPTORSHIP. 3 Hours.**

The purpose of this course is to allow students to earn college credit for relevant field work in the areas of biology and microbiology. Students must apply for the program and be cleared for registration during the semester prior to enrollment. This course offers an introduction to the general principles and the environment of the practice of medicine in various specialties. Students are afforded the opportunity to observe a physician in a real-world setting, often including inpatient and operating theater scenarios. Students will also be exposed to the primary literature and practice oral presentation skills over biomedical topics.

**BIOL 3349. COOPERATIVE PROGRAM IN BIOLOGY. 3 Hours.**

The purpose of this course is to allow students to earn college credit for relevant field work in the areas of biology and microbiology. Students must apply for the program and be cleared for registration during the semester prior to enrollment.

**BIOL 3352. INTRODUCTION TO FORENSIC LAB SCIENCE. 3 Hours.**

An introduction to the various disciplines of Forensic Science including DNA analysis, drug analysis, and firearms basics. Laboratory consists of hands-on investigation of mock crime scenes, fingerprint enhancement methods, and biological analysis of fluids. Prerequisite: BIOL 1441, BIOL 1442, CHEM 1441.

**BIOL 3353. FUNDAMENTAL MEDICAL MYCOLOGY. 3 Hours.**

Medical mycology deals with those infections in humans, and animals resulting from pathogenic fungi. As a separate discipline, the concepts, methods, diagnosis, and treatment of fungal diseases of humans are specific. Fundamental Medical Mycology balances clinical and laboratory knowledge to provide students with in-depth coverage of the most common fungal diseases and its etiologic agents from both the laboratory and clinical perspective. Prerequisite: BIOL 2444.

**BIOL 3355. TOXICOLOGY. 3 Hours.**

An introduction to the general principles of toxicology with an emphasis on certain classes of toxic agents, their sources and toxic effects, as well as their environmental fates. Pollution of various media (air, water and soil) and the differences between them will be discussed. Prerequisite: BIOL 1441, BIOL 1442, CHEM 1441 and CHEM 1442.

**BIOL 3356. ENVIRONMENTAL SYSTEMS, BIOLOGICAL ASPECTS. 3 Hours.**

Biological components of environmental systems. Population dynamics, species interactions, community structure, biodiversity, bioenergetics, nutrient cycling and human impacts are reviewed. Prerequisite: BIOL 1441, BIOL 1442.

**BIOL 3358. ASTROBIOLOGY II. 3 Hours.**

This is an interdisciplinary course between astrophysics, biology and geology. Topics include basic properties of life, habitability of Earth, studies of possible life regarding Mars, Europa & Titan, space missions, exoplanets and exomoons, stellar habitable zones, multistellar systems, exoEarths, biomarkers, SETI, Fermi paradox, Drake equation, cosmology. Offered as BIOL 3358, GEOL 3358, and PHYS 3358; credit will be granted only once. Prerequisite: PHYS 1441 & PHYS 1442 or equivalent and PHYS 2315 or PHYS 3315, or permission from instructor. Prerequisites for Biology majors: PHYS 1441 & PHYS 1442 or equivalent. Note that Astrobiology I is strongly recommended to students to be taken prior to Astrobiology II, but is not a prerequisite.

**BIOL 3359. MEDICAL MOLECULAR BIOLOGY. 3 Hours.**

This course is an introduction to modern molecular biology and human diseases. This course will use medical diseases, class projects, and problem sets to explore and learn modern molecular biology. The molecular mechanisms and underpinnings for several human diseases will be covered. Topics may include, gene regulation, the dynamic genome and how to rewrite it, modern cloning schemes, synthetic biology, and drug design. BIOL 3315 or BIOL 2444 are recommended, but not required. Prerequisite: BIOL 1441.

**BIOL 3409. PALEOANTHROPOLOGY. 4 Hours.**

Paleoanthropology: an exploration of fossil evidence for human origins and human evolution. Course focuses on the evolution of humans and our close relatives, from our origins as a distinct lineage to "anatomically modern" Homo sapiens, including the relationship between biological and cultural/behavioral evolution. Offered as BIOL 3409 and ANTH 3409; credit will be granted only once.

**BIOL 3410. SELECTED TOPICS IN BIOLOGY. 4 Hours.**

Topics in biology not treated in the regular curriculum. Topic, format, and prerequisites to be determined by the instructor. May include lab, service learning or any other experiential learning module. May be repeated for biology elective credit as different topics are offered. Prerequisite: BIOL 1441 or BIOL 1442.

**BIOL 3420. GENETICS METHODS LAB. 4 Hours.**

Computational and experimental approach to genomics research. The course theme will be transposable elements. Prerequisite: BIOL 3315.

**BIOL 3427. PLANT SCIENCE. 4 Hours.**

A survey of plant science including the importance of plants to people and the human side of botany: the structure, reproduction, physiology, and classification of plants. The laboratory includes the study of structure, function, reproduction, and classification of plants. Replaces BIOL 3327 and BIOL 3183. Credit cannot be given for BIOL 3427 and BIOL 3327 and 3183. Prerequisite: BIOL 1441, BIOL 1442 or equivalent.

**BIOL 3442. HUMAN PHYSIOLOGY. 4 Hours.**

A comparative study of vertebrate function. The general principles of physiological mechanisms on the cellular, tissue, organ, and organismal levels will be examined. Laboratory studies will complement lecture material and will stress experimental design, data analysis, and the understanding of critical research in physiology. Prerequisite: BIOL 1441, BIOL 1442.

**BIOL 3445. METHODS IN MOLECULAR MICROBIOLOGY. 4 Hours.**

An overview of different techniques used during manipulation of microorganisms. It will allow students to gain an historical perspective of techniques used in microbiology as well as learn state of the art molecular characterization of microorganisms and their genetic manipulation. Introduces biochemical, physiological, and molecular biology methods to assess community diversity and microbial activity in a variety of ecosystems. Bacterial growth and survival, population biology, and microbial interactions will also be discussed. Prerequisite: BIOL 1441 and BIOL 3444.



**BIOL 3446. HUMAN ANATOMY. 4 Hours.**

Study of the gross functional anatomy of the human body. Students will participate in laboratory exercises designed to familiarize them with human anatomical structures and their functions. Use of eponyms for anatomical terms will be minimized. Prerequisite: BIOL 1441, BIOL 1442 or 8 hours of Bioltran.

**BIOL 3454. GENERAL ZOOLOGY. 4 Hours.**

An overview of animal life including the diversity and evolution of major animal phyla, reproduction, development and aspects of physiological function. The laboratory examines form, function and phyletic relationships in a wide variety of animal types. Prerequisite: BIOL 1441, BIOL 1442, or equivalent, or permission of instructor.

**BIOL 3457. GENERAL ECOLOGY. 4 Hours.**

An examination of the theoretical and experimental aspects of the relationship between the biological and physical environments (organisms, food, space, and time) at the individual, population, community, and ecosystem levels. Prerequisite: BIOL 1441, BIOL 1442.

**BIOL 4089. RESEARCH IN BIOLOGY. 0 Hours.**

Research problems on an individual basis, conducted under the direction of a member of the biology faculty. Prerequisite: written permission of the supervising instructor prior to registration. This is a non-credit course. Prerequisite: Written permission of the supervising instructor prior to registration.

**BIOL 4179. RESEARCH AND DIRECTED STUDY. 1 Hour.**

Research or independent study by individual students in biology under the supervision of a biology faculty member. Topics must be approved by the supervising faculty member. Prerequisite: BIOL 1441, BIOL 1442, and permission of instructor.

**BIOL 4189. RESEARCH IN BIOLOGY. 1 Hour.**

Research problems on an individual basis, conducted under the direction of a member of the biology faculty. A limit of two hours per semester is imposed and only a total of three hours may be counted toward degree requirements. These courses are offered only on a pass/fail basis. Prerequisite: written permission of the supervising instructor prior to registration.

**BIOL 4279. RESEARCH AND DIRECTED STUDY. 2 Hours.**

Research or independent study by individual students in biology under the supervision of a biology faculty member. Topics must be approved by the supervising faculty member. Prerequisite: BIOL 1441, BIOL 1442, and permission of instructor.

**BIOL 4289. RESEARCH IN BIOLOGY. 2 Hours.**

Research problems on an individual basis, conducted under the direction of a member of the biology faculty. A limit of two hours per semester is imposed and only a total of three hours may be counted toward degree requirements. These courses are offered only on a pass/fail basis. Prerequisite: written permission of the supervising instructor prior to registration.

**BIOL 4303. MICROBIOMES: HEALTH AND THE ENVIRONMENT. 3 Hours.**

The development, interactions, and change of polymicrobial communities in both humans and the environment with implications in health, nutrition, disease, research, ecology and agriculture. Prerequisite: BIOL 2444.

**BIOL 4307. MOLECULAR EVOLUTION. 3 Hours.**

This course focuses on understanding how genes and genomes evolve at the molecular level. Molecular biology provides the data while population genetics provides the theoretical framework. Prerequisite: BIOL 3315, BIOL 3339.

**BIOL 4309. NEUROPHARMACOLOGY. 3 Hours.**

A survey of how drugs affect the nervous system. General topics will include cellular and molecular foundations of neuropharmacology, receptors and modulation of neural signaling. The specific role of neurotransmitter systems (i.e. acetylcholine, dopamine, norepinephrine, serotonin, and opiate) will be explored. Offered as BIOL 4309 and PSYC 4309; credit will be granted only once. Prerequisite: one or more of the following courses or permission of instructor: BIOL 1441 or PSYC 3322/BIOL 3322 or BIOL 3301.

**BIOL 4311. HISTOLOGY. 3 Hours.**

Histology is a branch of biological science concerned with structure and function of the organism on a cellular level. The objective in this class is to provide students with the skills and knowledge needed to identify and describe tissues and organs in the microscopic images based on the characteristic morphologies of cells and arrangement of tissues. Students will learn about basic histological techniques used in slide preparation, four basic tissue types and types of tissue, followed by the survey of microscopic images of all organ systems. This course bridges the "whole body" disciplines of anatomy and physiology and cell-level sciences such as cell physiology and genomics. It will help students understand how the differential expression of the genome leads to different cell morphology that in turn leads to different functions. Prerequisite: BIOL 1441, BIOL 1442.

**BIOL 4312. INTRODUCTION TO VIROLOGY. 3 Hours.**

The nature, reproduction, and host cell interactions of viruses and virus-like agents of bacteria, animals, and plants. Prerequisite: BIOL 2444.

**BIOL 4315. HORMONES AND BEHAVIOR. 3 Hours.**

A study of the interaction between hormones and behavior. Specific topics covered include; examination of the hormonal influences on sex determination, reproductive behaviors, parental behavior, dominance and aggression, responses to stressful stimuli, homeostasis, and learning and memory. This course uses a comparative approach and draws examples of neuroendocrine function from throughout the animal kingdom including fish, birds, reptiles, and mammals (including humans). Offered as PSYC 4315 and BIOL 4315. Credit will be granted only once. Prerequisite: PSYC 3322/BIOL 3322 or BIOL 1441 or BIOL 3301.

**BIOL 4316. GROWTH, DEVELOPMENT, AND EVOLUTION. 3 Hours.**

A survey of topics at the nexus of modern human biological research in growth and development and the evolutionary record of hominid subadults. Offered as BIOL 4316 and ANTH 4315; credit will be granted only in one department. Prerequisite is only required for students registering for ANTH 4315. Prerequisite: ANTH 2307 or permission of the instructor.

**BIOL 4317. BACTERIAL PATHOGENESIS. 3 Hours.**

Host-pathogen relationships in microbial diseases. Topics include bacterium-host interactions; pathogens and pathogenic factors; techniques in pathogenesis research; molecular mechanisms of pathogenesis by major bacterial pathogens; antimicrobial compounds and resistance to antibiotics; and discussion of human genomics and susceptibility to infections. Prerequisites: BIOL 3312, BIOL 2444.

**BIOL 4321. ADVANCED PROBLEM SOLVING IN BIOLOGY. 3 Hours.**

This course will focus on crucial techniques needed to solve application-based questions in biology. Students will develop and practice reading comprehension, problem solving, critical thinking, and reasoning skills while deepening their understanding of core biological concepts, including cell and molecular biology; biochemistry; anatomy and physiology; and behavior. The goal of this course is to improve students' critical reasoning skills to prepare them for problem-based exams. BIOL 3442 is recommended. Prerequisite: BIOL 1442, BIOL 3301, BIOL 3315.

**BIOL 4327. BEHAVIORAL GENETICS. 3 Hours.**

Genetic influences on behavioral phenotypes. Research strategies, quantitative methods, and pharmacogenetic approaches to the brain; sociality and altruism; the personality, emotionality and intelligence; psychopathology; chromosomal abnormalities; forensic implications of genetic counseling. Offered as BIOL 4327 and PSYC 4327; credit will be granted only once. Students seeking credit toward the science requirement must enroll in BIOL 4327. Prerequisite: PSYC 1315 or BIOL 1441.

**BIOL 4329. NEURAL ENGINEERING. 3 Hours.**

This course consists of both lecture/discussion and laboratory. Lecture topics include central and peripheral nervous system injury and regeneration, brain/machine interfacing, primary culture of neural cells, neuroinflammatory and neurodegenerative disease. Laboratories include embryonic and neonatal rat derived neuronal culturing, immunostaining and quantitative analysis. Prerequisites: BIOL 3301, CSE 1310, CHEM 2322, and MATH 3319.

**BIOL 4332. POLYMERS IN BIOMEDICAL ENGINEERING. 3 Hours.**

This is a foundation course in polymeric biomaterial design, synthesis, characterization, and processing. The topics include design, surface-engineering, functionalization, characterization, as well as micro- and nano-fabrication of polymeric biomaterials. The biomedical applications of the polymeric biomaterials and their interaction with cell/tissue is discussed. Prerequisite: BIOL 3301, CSE 1310, CHEM 2322 and MATH 3319.

**BIOL 4333. NANOBOMATERIALS. 3 Hours.**

Synthesis, fabrication, characterization, and biomedical applications of nanobiomaterials. Topics include synthetic nanobiomaterials, biological nanobiomaterials (DNA nanomaterials, protein and peptide nanomaterials, etc.), biofunctionalization of nanobiomaterials, use of nanobiomaterials in tissue engineering, drug delivery, gene delivery. Prerequisites: BIOL 3301, CSE 1310, CHEM 2322, and MATH 3319.

**BIOL 4343. RESEARCH METHODS - UTEACH. 3 Hours.**

The purpose of this course is to present UTeach students with the tools scientists use to solve scientific problems. These tools enable scientists to develop new knowledge and insights, the most important of which are eventually presented in textbooks and taught in more conventional science classes. These tools include: design of experiments to answer scientific questions; use of statistics to interpret experimental results and deal with sampling errors; mathematical modeling of scientific phenomena; finding and reading articles in the current scientific literature; applying scientific arguments in matters of social importance; writing scientific papers; reviewing scientific papers; oral presentation of scientific work; use of probes and computers to gather and analyze data; ethical treatment of human subjects; laboratory safety. Research Methods is primarily a laboratory course, and most of these topics are developed in connection with 4 independent inquiries UTeach students design and carry out. Written inquiries will be evaluated as examples of scientific writing. Prerequisite: SCIE 1201 or SCIE 1334 or concurrent enrollment; junior or senior standing.

**BIOL 4345. MICROBIAL PHYSIOLOGY. 3 Hours.**

This course considers the anatomy and physiology of the bacterial cell in detail. Lecture topics consider the molecular architecture of cell walls, membranes and organelles, synthesis of wall material and membranes, insertion of proteins into membranes and regulation of biosynthetic systems at the whole cell level. Prerequisite: BIOL 1441 and BIOL 3444. CHEM 4311 recommended.

**BIOL 4350. CONSERVATION BIOLOGY. 3 Hours.**

Introduction to theory and practice of conservation biology, with emphasis on applications of modern quantitative and genetic techniques to preservation of organisms and habitats. Topics include identification and prioritization of units for protection; conservation genetics; preserve design; public policy issues; and case studies. Prerequisite: BIOL 3315 or equivalent (Genetics), or permission of the instructor.

**BIOL 4352. FORENSIC BIOLOGY. 3 Hours.**

A comprehensive review of biological principles, applied to forensic science, including sample recovery and handling, analytical techniques, profile matching/exclusion, reporting, and testimony. Prerequisite: BIOL 3315; statistics course recommended; or permission of instructor.

**BIOL 4355. METHODS IN FORENSIC BIOLOGY. 3 Hours.**

Analysis of typical biological evidentiary samples including extraction of DNA, quantitation, amplification and electrophoresis of examples. Instrumentation utilized includes thermal cyclers and ABI 377 genetic analyzer. Prerequisite: BIOL 4352 or concurrent enrollment.

**BIOL 4357. HEALTH PSYCHOLOGY. 3 Hours.**

This course provides a broad introduction to health psychology and its interface with the medical world. The course provides a balanced presentation of the important issues in the field, as well as specific content topics that are especially relevant today to better understand health and illness. Offered as BIOL 4357, HEED 4357, and PSYC 4357. Students seeking science requirement credit must enroll in BIOL 4357; students seeking Certification in Health must enroll in HEED 4357. Prerequisite: PSYC 1315 or BIOL 1333 or BIOL 1441 or BIOL 2457; junior standing recommended.

**BIOL 4365. TISSUE ENGINEERING LAB. 3 Hours.**

Each student will be given the opportunity to perform the techniques commonly used in tissue engineering and biomaterial research. These techniques are culture media preparation, cell culture/subculture, degradable scaffold preparation, scaffold modification, histological sections and staining, and cell imaging analyses. Prerequisites: BIOL 3301, CSE 1310, CHEM 2322, and MATH 3319.

**BIOL 4379. RESEARCH AND DIRECTED STUDY. 3 Hours.**

Research or independent study by individual students in biology under the supervision of a biology faculty member. Topics must be approved by the supervising faculty member. Prerequisite: BIOL 1441, BIOL 1442, and permission of instructor.

**BIOL 4388. INSTRUCTIONAL TECHNIQUES IN BIOLOGY. 3 Hours.**

Students will participate in laboratory instruction and student recitation sessions under the supervision of a faculty member. A maximum of 3 hours can be applied to the major for biology or microbiology credit. Enrollment by departmental permission only. A maximum of 6 hours credit from this class will be used to calculate a student's grade point average. Students on probation or who have not qualified for major status may not enroll in this course.

**BIOL 4389. RESEARCH IN BIOLOGY. 3 Hours.**

Research problems on an individual basis, conducted under the direction of a member of the biology faculty. A limit of two hours per semester is imposed and only a total of three hours may be counted toward degree requirements. These courses are offered only on a pass/fail basis. Prerequisite: written permission of the supervising instructor prior to registration.

**BIOL 4390. INSTRUCTIONAL TECHNIQUES IN MICROBIOLOGY. 3 Hours.**

Students will participate in laboratory instruction and laboratory preparation under the supervision of the lab coordinator. A maximum of 3 hours can be applied to the major for biology or microbiology credit. Enrollment by departmental permission only. A maximum of 6 hours credit from this class will be used to calculate a student's grade point average. Students on probation or who have not qualified for major status may not enroll in this course.

**BIOL 4392. INSTRUCTIONAL TECHNIQUES IN MICROBIOLOGY LEADER. 3 Hours.**

Students will take on a leadership role in laboratory instruction and preparation under the supervision of the lab coordinator. Students will strengthen their skill set and gain experience in a supervisory role. A maximum of 3 hours can be applied to the major for biology or microbiology credit. Enrollment by departmental permission only. A maximum of 6 hours credit from this class will be used to calculate a student's grade point average. Students on probation or who have not qualified for major status may not enroll in this course.

**BIOL 4393. HONORS SENIOR PROJECT IN BIOLOGY. 3 Hours.**

A topic will be selected after consultation with a supervising professor and will involve both original research and writing a formal report. The work will be evaluated by a faculty honors committee. Completion of this course will satisfy the thesis requirement for the Honors College described elsewhere in this catalog.

**BIOL 4395. FORENSICS-EL PA. 3 Hours.****BIOL 4406. HUMAN OSTEOLOGY. 4 Hours.**

Detailed examination of human skeletal morphology. Topics include form and function of all skeletal elements in the human body, differentiation of each bone, left and right side identification, identification of fragmented remains, and muscle attachments and articulations. Content useful in forensic anthropology, archaeology, and hominid paleontology. Offered as BIOL 4406 and ANTH 4406; credit will be granted only in one department.

**BIOL 4421. ADVANCED TOPICS IN NEUROSCIENCE. 4 Hours.**

This course will cover current topics in Neuroscience using an interactive, participatory format that includes a lecture portion and a laboratory section. The course will focus on specific content topics that are especially relevant today to better understand and use advanced concepts in Neuroscience research. Completion of this course is essential for students who are interested in pursuing a career in Neuroscience research. Offered as BIOL 4421 or PSYC 4421. Credit will be granted only once. Junior standing recommended. Prerequisite: C or better in BIOL 3322 or PSYC 3322.

**BIOL 4440. LABORATORY METHODS IN BACTERIAL PATHOGENESIS. 4 Hours.**

This course is intended to expose students to research techniques for studying bacterial pathogens. Students will use molecular and classical techniques to isolate, identify, and characterize bacteria and their response to stimuli. Techniques will range from polymerase chain reaction (PCR), gene sequencing, sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) and Immunofluorescence Microscopy. Prerequisites: BIOL 3312, BIOL 3444, BIOL 4317, or permission of instructor.

**BIOL 4441. ADVANCED MICROBIOLOGY LAB. 4 Hours.**

An overview of advanced microbiology techniques used in microbial genetics and physiology. It will allow students not only to gain an advanced and applicable perspective of techniques used in microbiology, but also to learn current state-of-the-art molecular techniques for genetic manipulation and physiological characterization of microorganisms. Included are molecular, physiological, and biochemical methods as well as metagenomics approaches and basic analysis of sequencing data for studying microbiomes. Enrollment requirements: BIOL 1441, General Microbiology (BIOL 2444), and Microbial Genetics (BIOL 3304). Prerequisite: BIOL 1441, BIOL 2444, BIOL 3304.



**BIOL 4459. BIOARCHAEOLOGY. 4 Hours.**

The study of human remains in archaeological contexts in order to reconstruct individual identity, life history, and past population characteristics. No formal prerequisites, but familiarity with the human skeleton is helpful. Lab component is required. Offered as BIOL 4459 and ANTH 4459; credit will be granted only in one department.

**BIOL 4460. ZOOARCHAEOLOGY. 4 Hours.**

The study of faunal remains from archaeological contexts to understand past human economic strategies and ecological circumstances. Topics include skeletal and taxonomic identification, taphonomic processes, mortality profiles, biometric analyses, and human behavioral ecology. Lab component is required. Offered as BIOL 4460 and ANTH 4460; credit will be granted only once.

**BIOL 5101. SPECIAL TOPICS IN BIOLOGY. 1 Hour.**

Seminar on significant biological research. May be repeated for credit. Prerequisite: consent of the instructor.

**BIOL 5102. PROFESSIONAL DEVELOPMENT. 1 Hour.**

This course will provide senior graduate students with important information regarding various aspects of their professional development including job searching, interviewing, stress and time management, and professional ethics.

**BIOL 5193. RESEARCH IN BIOLOGY. 1 Hour.**

Conference course in which the student undertakes intensive investigation of topics under the supervision of a staff member. Prerequisite: consent of the instructor. Graded P/F/R.

**BIOL 5291. INDIVIDUAL PROBLEMS IN BIOLOGY. 2 Hours.**

Individual research projects supervised by a faculty member. Prerequisite: consent of the instructor.

**BIOL 5293. RESEARCH. 2 Hours.****BIOL 5301. LABORATORY ROTATION. 3 Hours.**

This course is an elective designed to enable students to choose a major advisor and laboratory. Rotations among two or three faculty laboratories will familiarize students with faculty research interests, sharpen individual research skills, and expose students to different study systems, instruments, and research methods. May only be taken once for credit by MS students; may be repeated for credit once by Ph.D. students.

**BIOL 5302. MICROBIAL GENETICS. 3 Hours.**

Consideration of the nature, expression and regulation of the genetic processes in micro-organisms.

**BIOL 5303. MICROBIOMES: HEALTH AND THE ENVIRONMENT. 3 Hours.**

The development, interactions, and change of polymicrobial communities in both humans and the environment with implications in health, nutrition, disease, research, ecology and agriculture.

**BIOL 5304. VIROLOGY. 3 Hours.**

The nature, reproduction and host-cell interactions of viruses and animals. Emphasizes molecular aspects of viral replication and the molecular basis of pathogenesis. Prerequisite: consent of the instructor.

**BIOL 5307. NEUROBIOLOGY. 3 Hours.**

General principles of the function, structure, and organization of the nervous system. Topics include the gross and microscopic anatomy of nervous tissues; physical and chemical basis for action potentials and synaptic transmission; sensory and motor pathways of transduction; molecular, cellular, and systems study of learning and memory; development; and a study of neural diseases and disorders.

**BIOL 5309. IMMUNOLOGY. 3 Hours.**

This course is designed to acquaint students with the cellular processes involved in the generation of an immune response. It will provide students with detailed knowledge of the cells and organs of the immune system, their organization and diversity and their specialized functions at different anatomical locations. The importance of immune cell receptors and cytokines in cellular interactions and co-ordination of immunological mechanisms is also emphasized.

**BIOL 5310. SELECTED TOPICS IN BIOLOGY. 3 Hours.**

Topics may vary depending on the needs and interests of the students. May be repeated for credit. Prerequisite: consent of the student's thesis committee and the current course instructor.

**BIOL 5311. EVOLUTION. 3 Hours.**

Study of the origin of living systems and the mechanism of their evolution.

**BIOL 5312. ADVANCED GENETICS. 3 Hours.**

Mechanisms of transmission and function of genetic material. Covers fundamental concepts in transmission genetics including: genotype/phenotype relationships; inheritance; linkage; genome organization; and gene expression. Experimental and quantitative approaches to genetic analyses are emphasized. Prerequisite: consent of the instructor.

**BIOL 5314. BIOMETRY. 3 Hours.**

An examination of statistical methods and procedures in relation to the design of biological experiments and the analysis of their results. Prerequisite: consent of the instructor.

**BIOL 5315. COMMUNITY ECOLOGY. 3 Hours.**

An investigation of the effects of interspecific interactions on the distribution and abundance of organisms. Prerequisite: consent of the instructor.

**BIOL 5317. BACTERIAL PATHOGENESIS. 3 Hours.**

Host-pathogen relationships in microbial diseases. Topics include bacterium-host interactions, pathogens and pathogenic factors: techniques in pathogenesis research: molecular mechanisms of pathogenesis by major bacterial pathogens; antimicrobial compounds and resistance to antibiotics; and discussion of human genomics and susceptibility to infections.

**BIOL 5319. HUMAN GENETICS. 3 Hours.**

This course will enable students to comprehend the basic principles of genetics applied to human inheritance and disease, to interpret the research strategies aimed to identify and study the genes responsible for diverse functions and traits, as well as to assess the consequences of the genetic technologies in our society.

**BIOL 5321. ADVANCED PROBLEM SOLVING IN BIOLOGY. 3 Hours.**

This course will focus on crucial techniques needed to solve application-based questions in biology. Students will develop and practice reading comprehension, problem solving, critical thinking, and reasoning skills while deepening their understanding of core biological concepts, including cell and molecular biology; biochemistry; anatomy and physiology; and behavior. The goal of this course is to improve students' critical reasoning skills to prepare them for problem-based exams. BIOL 3442 is recommended. Prerequisite: BIOL 1442, BIOL 3301, BIOL 3315.

**BIOL 5325. PLANT ECOLOGY. 3 Hours.**

An introduction to plant ecology including physiological, population, community and ecosystem ecology.

**BIOL 5335. ESSENTIALS OF GENOMICS. 3 Hours.**

An integrative approach to genome science, combining elements of genetics, statistics and bioinformatics. Current technologies used in genomics analysis will be presented.

**BIOL 5336. MOLECULAR EVOLUTION. 3 Hours.**

An exploration of how genes and genomes evolve at the molecular level. The presentation uses the theoretical framework provided by population genetics to analyze molecular biology data.

**BIOL 5340. BIOINFORMATICS. 3 Hours.**

This course is an applied introduction to bioinformatics and computational genomics. The course is geared toward the student with a biology background and limited programming experience. The course provides an entrance to commonly used programming/scripting languages and an introduction to numerous aspects of modern genomic data analyses (e.g. identification of coding and regulatory features in novel sequences, expression analysis, and comparative/phylogenetic analyses).

**BIOL 5342. DEVELOPMENTAL BIOLOGY IN HEALTH AND DISEASE. 3 Hours.**

An introduction to fundamental developmental events that form complex organisms with an emphasis on human health and disease.

**BIOL 5349. COOPERATIVE PROGRAM IN BIOLOGY. 3 Hours.**

The purpose of this course is to allow students to earn credit for relevant field work in the areas of biology and microbiology. Students must apply for the program and be cleared for registration during the semester prior to enrollment.

**BIOL 5350. CONSERVATION BIOLOGY. 3 Hours.**

Theory and practice of conservation biology, with emphasis on applications of modern quantitative and molecular genetic techniques to preservation of organisms and habitats. Includes: identification and prioritization of units for protection; conservation genetics; preserve design; public policy; and current case studies. Prerequisites: BIOL 3315 or equivalent or consent of the instructor.

**BIOL 5351. ENVIRONMENTAL MICROBIOLOGY. 3 Hours.**

Principles, methodology, and practical applications of environmental microbiology. Topics include: habitat and community approaches to environmental microbiology; measures of microbial populations and activities; interactions among microbial communities; role of microorganisms in the origin of mineral resources and pollution and energy flow through microbial communities. Prerequisite: BIOL 3444 or equivalent or consent of the instructor.

**BIOL 5353. FUNDAMENTAL MEDICAL MYCOLOGY. 3 Hours.**

Medical mycology deals with those infections in humans, and animals resulting from pathogenic fungi. As a separate discipline, the concepts, methods, diagnosis, and treatment of fungal diseases of humans are specific. Fundamental Medical Mycology balances clinical and laboratory knowledge to provide students with in-depth coverage of the most common fungal diseases and its etiologic agents from both the laboratory and clinical perspective.

**BIOL 5354. LIMNOLOGY. 3 Hours.**

The study of biotic and abiotic components of inland waters. Prerequisite: consent of the instructor.

**BIOL 5355. TOXICOLOGY. 3 Hours.**

An introduction to the general principles of toxicology with an emphasis on certain classes of toxic agents, their sources and toxic effects, as well as their environmental fates. Pollution of various media (air, water and soil) and the differences between them will be discussed.

**BIOL 5359. MEDICAL MOLECULAR BIOLOGY. 3 Hours.**

This course is an introduction to modern molecular biology and human diseases. This course will use medical diseases, class projects, and problem sets to explore and learn modern molecular biology. The molecular mechanisms and underpinnings for several human diseases will be covered. Topics may include, gene regulation, the dynamic genome and how to rewrite it, modern cloning schemes, synthetic biology, and drug design.

**BIOL 5366. ADVANCED ORGANISMAL PHYSIOLOGY. 3 Hours.**

In this course, the fundamentals of the structure (anatomy) and function (physiology) of "higher" plants and animals are discussed. Cellular, tissue, organ, and organismal levels will be the focus. General topics will include energy acquisition, distribution of nutrients, fluid transport, gas exchange, defense, sensing and responding to the environment, and reproduction. An understanding of basic biological concepts is expected.

**BIOL 5391. INDIVIDUAL PROBLEMS IN BIOLOGY. 3 Hours.**

Individual research projects supervised by a faculty member. Prerequisite: consent of the instructor.

**BIOL 5393. RESEARCH IN BIOLOGY. 3 Hours.**

Conference course in which the student undertakes intensive investigation of topics under the supervision of a staff member. Prerequisite: consent of the instructor. Graded P/F/R.

**BIOL 5398. THESIS. 3 Hours.**

Graded R/F only. Prerequisite: consent of faculty.

**BIOL 5420. GENETICS METHODS LAB. 4 Hours.**

Computational and experimental approach to genomics research. The course theme will be transposable elements.

**BIOL 5421. METHODS IN MOLECULAR MICROBIOLOGY. 4 Hours.**

This course will provide an overview of different techniques used during manipulation of microorganisms. It will allow students to gain a historical perspective of techniques used in microbiology (Winogradsky column, Koch solid agar plating) as well as learn state of the art molecular characterization of microorganisms and their genetic manipulation. This course introduces current biochemical, physiological and molecular biology methods to assess community diversity and microbial activity in a variety of ecosystems. Other topics discussed include bacterial growth and survival, population biology, and microbial interactions.

**BIOL 5440. LABORATORY METHODS IN BACTERIAL PATHOGENESIS. 4 Hours.**

This course is intended to expose students to research techniques for studying bacterial pathogens. Students will use molecular and classical techniques to isolate, identify and characterize bacteria and their response to stimuli. Techniques will range from PCR, Gene Sequencing, SDS\_PAGE and Immunofluorescence Microscopy. Prerequisite: BIOL 3312, BIOL 3444, BIOL 4317.

**BIOL 5493. RESEARCH. 4 Hours.****BIOL 5593. RESEARCH. 5 Hours.****BIOL 5693. RESEARCH IN BIOLOGY. 6 Hours.**

Conference course in which the student undertakes intensive investigation of topics under the supervision of a staff member. Prerequisite: consent of the instructor. Graded P/F/R.

**BIOL 5698. THESIS. 6 Hours.**

Graded P/F/R. Prerequisite: consent of faculty.

**BIOL 5998. THESIS. 9 Hours.**

Graded P/F/R. Prerequisite: consent of faculty.

**BIOL 6191. ADVANCED RESEARCH. 1 Hour.**

Faculty supervised individual research. May be repeated for credit. Graded P/F/R.

**BIOL 6291. ADVANCED RESEARCH. 2 Hours.**

Faculty supervised individual research. May be repeated for credit. Graded P/F/R.

**BIOL 6301. ESSENTIAL TOPICS IN GENOMICS. 3 Hours.**

This course will explore diverse aspects of genome biology, including the evolutionary principles that influence how genomes change through time, genome structure, and genome function. Emphasis will be given on how genome technology influences the way we do modern biology and how genomics influences the world around us.

**BIOL 6302. MICROBIOLOGY, MOLECULAR AND CELLULAR BIOLOGY. 3 Hours.**

Using model microorganisms, this course will investigate their (1)Physiology, biochemistry, and genetics, (2)The hosts innate and adaptive immune responses, (3)The molecular basis for virulence and pathogenesis and (4)The ecological and economic impact of microbial pathogens including epidemics and pandemics.

**BIOL 6303. ADVANCED EVOLUTION AND ECOLOGY. 3 Hours.**

Biodiversity, encompassing 8.7 million species, is the most distinctive feature of Earth. In this class, students will learn about the evolutionary and ecological forces shaping biodiversity, the measures of biodiversity from local to global scales, biogeographical patterns of biodiversity, the benefits of biodiversity to humans and ecosystems, and the major threats to biodiversity due to human activities.

**BIOL 6310. SELECTED TOPICS IN BIOLOGY FOR PhD STUDENTS. 3 Hours.**

Topics may vary depending on the needs and interests of the students. May be repeated for credit. This course is specific to students in the PhD program.

**BIOL 6391. ADVANCED RESEARCH. 3 Hours.**

Faculty supervised individual research. May be repeated for credit. Graded P/F/R.

**BIOL 6399. DISSERTATION. 3 Hours.**

BIOL 6399 and BIOL 6699 graded R/F only; BIOL 6999 graded P/F/R. Prerequisite: admission to candidacy for the degree Doctor of Philosophy in Quantitative Biology.

**BIOL 6491. ADVANCED RESEARCH. 4 Hours.**

Faculty supervised individual research. May be repeated for credit. Graded P/F/R.

**BIOL 6591. ADVANCED RESEARCH. 5 Hours.**

Faculty supervised individual research. May be repeated for credit. Graded P/F/R.

**BIOL 6691. ADVANCED RESEARCH. 6 Hours.**

Faculty supervised individual research. May be repeated for credit. Graded P/F/R.

**BIOL 6699. DISSERTATION. 6 Hours.**

BIOL 6399 and BIOL 6699 graded R/F only; BIOL 6999 graded P/F/R. Prerequisite: admission to candidacy for the degree Doctor of Philosophy in Quantitative Biology.

**BIOL 6999. DISSERTATION. 9 Hours.**

BIOL 6399 and BIOL 6699 graded R/F only; BIOL 6999 graded P/F/R. Prerequisite: admission to candidacy for the degree Doctor of Philosophy in Quantitative Biology.

**BIOL 7399. DOCTORAL DEGREE COMPLETION. 3 Hours.**

This course may be taken during the semester in which a student expects to complete all requirements for the doctoral degree and graduate. Enrolling in this course meets minimum enrollment requirements for graduation, for holding fellowships awarded by The Office of Graduate Studies and for full-time GTA or GRA positions. Students should verify that enrollment in this course meets other applicable enrollment requirements. To remain eligible in their final semester of study for grants, loans or other forms of financial aid administered by the Financial Aid Office must enroll in a minimum of 5 hours as required by the Office of Financial Aid. Other funding sources may also require more than 3-hours of enrollment. Additional hours may also be required to meet requirements set by immigration law or by the policies of the student's degree program. Students should contact the Financial Aid Office, other sources of funding, Office of International Education and/or their graduate advisor to verify enrollment requirements before registering for this course. This course may only be taken once and may not be repeated. Students who do not complete all graduation requirements while enrolled in this course must enroll in a minimum of 6 dissertation hours (6699 or 6999) in their graduation term. Graded P/F/R.