

# BIOLOGY (BIOL)

## BIOL 1106 General Biology I Lab

**Credit:** 1 (0-3-0)

This course provides hands-on laboratory experiences that highlight the fundamental molecular, cellular, and genetic principles characterizing living organisms. The scientific method in the discovery of these principles will be the primary focus of the hands-on activities. This course is designed for students majoring in science fields. Student majoring or minoring in biology cannot use placement exams (e.g. CLEP) to fulfill this course requirement. Students majoring or minoring in Biology must earn a C to be considered passing. Other programs with this course as a requirement may also request an earned grade of a C.

**Corequisites:** BIOL 1306. TSI Restriction(s): Reading, Math, Writing

**Restrictions:** Graduate level students may not enroll.

## BIOL 1107 General Biology II - Lab

**Credit:** 1 (0-3-0)

This course provides hands-on laboratory experiences that highlight the fundamental principles concerning the biology of organisms: biodiversity, evolutionary relationships among major groups of organisms, structural/functional characteristics of these organisms, and general ecological principles of the organismal relationships. This course is designed for students majoring in science fields. Students majoring or minoring in biology cannot use placement exams (e.g. CLEP) to fulfill this course requirement. Students majoring or minoring in Biology must earn a C to be considered passing. Other programs with this course as a requirement may also request an earned grade of a C.

**Prerequisites:** Passing grade of C or better in BIOL 1306 and BIOL 1106.

**Corequisites:** BIOL 1307-General Biology II - Biology of Organisms. TSI Restriction(s): Reading, Math, Writing

**Restrictions:** Graduate level students may not enroll.

## BIOL 1306 Gen Biology I-Attr Living Sys

**Credits:** 3 (3-0-0)

This course examines the fundamental molecular, cellular, and genetic principles characterizing living organisms including the role of the scientific method in the discovery of these principles. Specific concepts include the chemical basis for life, energy transformations, cell structure and function, the metabolic processes of respiration and photosynthesis, cell reproduction, and basic concepts of heredity and genetics. This course is designed for students majoring in science fields. College Algebra is recommended prior to taking this course. This course meets the standards for the Life and Physical Sciences category of courses under the core curriculum. Students majoring or minoring in Biology cannot use placement exams (e.g. CLEP) to fulfill this course requirement. Students majoring or minoring in Biology must earn a C to be considered passing. Other programs with this course as a requirement may also request an earned grade of a C. Corequisite for students majoring or minoring in biology: BIOL 1106 – General Biology I Laboratory. TSI Restriction(s): Reading, Writing

**Restrictions:** Graduate level students may not enroll.

## BIOL 1307 Gen Biology II-Biol Organisms

**Credits:** 3 (3-0-0)

This course provides an overview of the diversity of life, the evolutionary relationships among major groups of organisms, and the structural/functional characteristics of these organisms. Topics emphasized will include the study of life at the organismal, population, and community level including form, function, reproduction, taxonomy, systematics, ecology and evolutionary history of biodiversity. This course is designed for students majoring in science fields. This course meets the standards for the Life and Physical Sciences category of courses under the core curriculum. Students majoring or minoring in Biology cannot use placement exams (e.g. CLEP) to fulfill this course requirement. Students majoring or minoring in Biology must earn a C to be considered passing. Corequisite for students majoring or minoring in biology: BIOL 1107 – General Biology II Laboratory.

**Prerequisites:** BIOL 1306 and BIOL 1106.

**Corequisites:** BIOL 1107. TSI Restriction(s): Reading, Writing

**Restrictions:** Graduate level students may not enroll.

## BIOL 1308 Intro to Life Sciences I

**Credits:** 3 (3-0-0)

This course is designed for non-science majors and examines the basis of biology in the modern world and explores biology as a science – a data-driven process of gaining new knowledge – as well as the impact of biological science on society. Topics in this course include the study of life at the cellular level, investigating cellular structures, chemical processes, cell metabolism, cell division, gene expression and introduction patterns of inheritance. Includes experimental hands-on exercises. This course meets the standards for the Life and Physical Sciences category of courses under the core curriculum. TSI Restriction(s): Reading, Writing

**Restrictions:** Graduate level students may not enroll.

## BIOL 1309 Intro to Life Sciences II

**Credits:** 3 (3-0-0)

This course is designed for non-science majors. Students examine the principles of organismal biology, biodiversity and ecology in the modern world and how these principles relate to issue in today's society and their broader meaning to the public. Topics in this second course include the study of life at the organismal level considering their morphology, life histories, physiology, and ecology. The nature and evolution of biological diversity and how that diversity is studied is included. Experimental hands-on exercises are included. This course meets the standards for the Life and Physical Sciences category of courses under the core curriculum. TSI Restriction(s): Reading

**Restrictions:** Graduate level students may not enroll.

## BIOL 2190 Independent Study

**Credit:** 1 (0-1-0)

This is a course designed to help transfer students in biology complete the necessary degree requirements for biology particularly when their former institution did not require a laboratory section of the course. Instructor permission is required. TSI Restriction(s): Reading

**Restrictions:** Enrollment is limited to Undergraduate level students.

**BIOL 2401 Anatomy & Physiology I****Credits:** 4 (3-1-0)

Study of the structure and function of human anatomy, including integumentary, musculoskeletal, and neural systems. With laboratory section. This course meets the standards for the Life and Physical Sciences category of courses under the core curriculum. TSI Restriction(s): Reading, Writing

**Restrictions:** Graduate level students may not enroll.**BIOL 2402 Anatomy & Physiology II****Credits:** 4 (3-3-0)

Study of the structure and function of human anatomy, including the cardiovascular system, lymphatic system, respiratory system, endocrine system, digestive system, metabolism, urinary system, and reproductive system. With laboratory section. This course meets the standards for the Life and Physical Sciences category of courses under the core curriculum. TSI Restriction(s): Reading, Math, Writing

**Prerequisites:** BIOL 2401 - Anatomy Physiology I.**Restrictions:** Graduate level students may not enroll.**BIOL 2406 Intro to Plant Biology****Credits:** 4 (3-1-0)

The course introduces the student to plant tissues and structures, basic plant cell metabolism, cell division and reproduction, genetics and evolution of plants, basic plant systematics, plants and humans, and plant ecology. With laboratory section. TSI Restriction(s): Reading, Math, Writing

**Prerequisites:** BIOL 1307 or BIOL 1309.**Restrictions:** Graduate level students may not enroll.**BIOL 2410 Topics in Biology****Credits:** 4 (3-1-0)

Lectures, literature investigation and research in selected topics. With laboratory section. May be repeated for credit once under different topic.

**Prerequisites:** An earned C or better in BIOL 1306, BIOL 1307, and BIOL 1107.**Restrictions:** Enrollment is limited to Undergraduate level students.**BIOL 2411 Genetics****Credits:** 4 (3-1-0)

This class covers fundamental aspects of heredity, with an emphasis on eukaryotic systems. Topics covered include transmission genetics, linkage and gene mapping. Students majoring or minoring in Biology must earn a C to be considered passing. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** A passing grade of C or better in BIOL 1306, BIOL 1106, BIOL 1307, BIOL 1107, and MATH 1314.**Restrictions:** Graduate level students may not enroll.**BIOL 2415 Statistics in Biology & Medicine****Credits:** 4 (3-1-0)

Explores the principles of probability, exploratory data analysis, experimental design and common inferential statistical techniques used in the biographical and medical sciences. Emphasis is placed on the applications of these methods and practical considerations associated with their proper use. A major focus of the laboratory portion of the course is using statistical computing environments for methodological implementation and generation of high quality scientific figures. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** MATH 1314 or equivalent, a grade of C or better in BIOL 1106, BIOL 1107, BIOL 1306, BIOL 1307.**Restrictions:** Graduate level students may not enroll.**BIOL 2421 Introduction to Microbiology****Credits:** 4 (3-3-0)

This course addresses the biology of an array of microorganisms including archaea, bacteria, viruses and eukaryotic microbes such as fungi. Topics will include organism morphology, structure, growth and reproduction, and use of antimicrobial compounds. Discussion of the medical, industrial, and environmental impact of microbes will be included. With laboratory section. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** A grade of C or better in BIOL 1306/1106, BIOL 1307 /1107 also CHEM 1311/1111.**Restrictions:** Graduate level students may not enroll.**BIOL 2431 Cell Biology****Credits:** 4 (3-3-0)

This course is an introduction to cell structures and how they function, with an emphasis on eukaryotic cells. Topics will include membrane structure, membrane transport, organelles, protein syntheses and folding, cellular energetics and cell cycle. Experiments and techniques used to study cell biology processes will be emphasized. With laboratory section. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** Passing grade of C or better in BIOL 1306 and BIOL 1106.**Restrictions:** Graduate level students may not enroll.**BIOL 2490 Topics in Biology****Credits:** 4 (4-0-0)

Lectures, literature investigation and research in selected topics. With laboratory section. May be repeated for credit once under different topic.

**Prerequisites:** an earned grade of C or better in BIOL 1306, BIOL 1307, and BIOL 1107 TSI Restriction(s): Reading, Math, and Writing**Restrictions:** Enrollment is limited to Undergraduate level students.**Repeat Status:** Course may be repeated 1 time(s).

**BIOL 3104 Research Experience in Biology****Credit:** 1 (1-0-0)

Research Experience in Biology is aimed at providing an introductory research experience in a biology faculty laboratory. Through this experience the student will gain an understanding of how research is conducted outside of a classroom and how the scientific method is actively applied in the specific discipline of the faculty research interests. Students will become part of the research team and will participate in laboratory or field activities as well as meetings/discussions. This course can be repeated for credit for a maximum of 2 credits, the second of which must be under a different faculty member and thus a different discipline in Biology. This course is recommended to be taken before BIOL 4304: Research Projects in Biology. This course does not fulfill "Undergraduate Research". TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** BIOL 1306, BIOL 1106, BIOL 1307, BIOL 1107.**Restrictions:** Graduate level students may not enroll.**Repeat Status:** Course may be repeated 1 time(s).**BIOL 3302 History of Biology****Credits:** 3 (3-0-0)

The main goal of this course is to provide the student with an overview of the history of modern life sciences, beginning with a brief overview of ancient history through modern day advancements in thoughts on Genetics, Evolution, Conservation, etc. with a focus mainly on the 17th century to present day. We will examine how naturalists and biologists have searched for order in nature—from cabinets of curiosity to maps of biodiversity, and from the theory of cells to the structure of DNA. In this course, students will examine the development of changing practices and approaches to investigating life in the field, the museum, and the laboratory including discussions on ethics in the sciences throughout history.

**Prerequisites:** BIOL 1306 or BIOL 1308.**Restrictions:****BIOL 3303 Animal Nutrition****Credits:** 3 (3-0-0)

Animal Nutrition examines how wild, domestic, and exotic animals derive energy and nutrients from food given variation in anatomy, physiology, and biochemistry of their digestive systems. Emphasis will be placed on the sources, metabolism, and nutrition of macromolecules, supplementation, regulation of food intake, and metabolic disease. This course is designed for Biology majors and specifically intended for students interested in applying to Veterinary School.

**Prerequisites:** BIOL 1306, 1307 or equivalent with a grade of C or better.**Restrictions:** Enrollment is limited to Undergraduate level students.**BIOL 3304 Biotechniques****Credits:** 3 (1-4-0)

Focus on applications of modern molecular techniques that are used in biology. This course has a 1-hour seminar and two 2-hour laboratory sessions.

**Prerequisites:** BIOL 2411 TSI Restriction(s): Reading, Math, and Writing**Restrictions:** Graduate level students may not enroll.**BIOL 3375 Applied Entomology****Credits:** 3 (3-0-0)

The characteristics, life history, and identification of insects important to man, with particular reference to agriculture and disease vectors. Stress will be on control measures for harmful species.

**Prerequisites:** BIOL 1307 or BIOL 1309 TSI Restriction(s): Reading, Math, and Writing**Restrictions:** Graduate level students may not enroll.**BIOL 3401 Invertebrate Zoology****Credits:** 4 (3-3-0)

Classification, anatomy, life history and evolution of invertebrates exclusive of insects. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** BIOL 1307 or BIOL 1309.**Restrictions:** Graduate level students may not enroll.**BIOL 3402 Evolution****Credits:** 4 (3-1-0)

This course surveys the evidence for biological evolution from molecular, cellular, biochemical, embryological, paleontological, genetic, and ecological perspectives. Particular emphasis is placed on how the genetic constitutions of populations change over time and evolutionary forces that are responsible for such change. Other topics emphasized in this course include the construction and interpretation of evolutionary trees and the evolution of cooperation and sociality. The laboratory component of this course emphasizes reading the primary evolutionary biology literature and the using computer simulations to gain insights into how evolutionary forces interact. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** BIOL 2415 or MATH 3301 and a passing grade of C or better in BIOL 2411 must be completed first.**Restrictions:** Graduate level students may not enroll.**BIOL 3403 Plant Taxonomy****Credits:** 4 (3-3-0)

An introductory course concerned with developing skill in recognition and identification of seed plants at the species and family levels. Emphasis will be placed on collection, use of keys and manuals and herbarium techniques.

**Prerequisites:** BIOL 1307 or BIOL 1309 TSI Restriction(s): Reading, Math, and Writing**Restrictions:** Graduate level students may not enroll.**BIOL 3405 Vertebrate Zoology****Credits:** 4 (3-3-0)

Anatomy, classification and natural history of the vertebrates; methods of collecting, preserving and identifying local vertebrates. With laboratory section. Recommended: BIOL 3402 TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** An earned grade of a C or better in BIOL 1307 or BIOL 1309.**Restrictions:** Graduate level students may not enroll.

**BIOL 3406 Animal Behavior****Credits:** 4 (3-0-1)

General introduction to the field of animal behavior. Topics include evolution and behavior, behavioral ecology, sociobiology, communication, orientation and navigation, and hormonal mechanisms of behavior. The one hour discussion section will focus on the exploration and critical analysis of current scientific literature. With discussion seminar. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** BIOL 1307 or BIOL 1309.**Restrictions:** Graduate level students may not enroll.**BIOL 3407 Ecology****Credits:** 4 (3-3-0)

This course provides the foundations of the scientific study of organisms and their environment. Basic components involved in the function and evolution of ecosystems, different ecological models, and the mechanisms that drive ecosystem changes through time will be addressed. Students will learn to approach the study of ecology from the organismal to global scale. The course will incorporate the classic concepts of ecology and will introduce the students into current theoretical and applied fields of ecology. With laboratory section. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** A passing grade of C or better in BIOL 1307 and BIOL 1107.**Restrictions:** Graduate level students may not enroll.**BIOL 3408 Animal Physiology****Credits:** 4 (3-3-0)

A study of the fundamental process of the animal systems. With laboratory section. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** An earned grade of C or better in BIOL 1306, 1106, 1307 and 1107.**Restrictions:** Graduate level students may not enroll.**BIOL 3409 Cellular Physiology****Credits:** 4 (3-1-0)

This course is the study of how different biochemical, metabolic, and molecular pathways of the cell work together to produce the many functions of cells such as movement, response to hormones, growth, protein synthesis, etc. Topics of signal transduction pathways, protein targeting, secretion and endocytosis, and cellular organization and motility are covered. Cell-cell interactions and tissue formation will be discussed, including the loss of cell division control leading to cancer. With laboratory section. Recommended: CHEM 2323 and CHEM 2123. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** An earned C or better in BIOL 2411, BIOL 2421.**Restrictions:** Graduate level students may not enroll.**BIOL 3410 Comparative Vertebrate Anatomy****Credits:** 4 (4-3-0)

Comparative Vertebrate Anatomy examines vertebrate morphology in an evolutionary context with specific emphasis on the relationship of structure and function. Lectures will examine the origin and evolution of major vertebrate systems and the functional significance of morphological adaptation. The Laboratory component provides direct observation of major vertebrate organs and organ systems through dissection and comparison across representative organisms. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** Grade of C or better in BIOL 1306, BIOL 1307.**Restrictions:** Graduate level students may not enroll.**BIOL 4101 Seminar-Integrative Biology****Credit:** 1 (0-0-1)

Student-led reviews of current scientific literature on various topics in biology with critical class analyses. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** BIOL 3402 and ENGL 2311 or ENGL 1302 must be completed first.**Restrictions:** Graduate level students may not enroll.**BIOL 4102 Seminar-Cell/Molecular Biology****Credit:** 1 (1-0-0)

Student-led reviews of current scientific literature on cellular and molecular biology with critical class analyses. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** BIOL 2411; BIOL 3409 or BIOL 4401 or BIOL 4406; ENGL 2311 or ENGL 1302 must be completed first.**Restrictions:** Graduate level students may not enroll.**BIOL 4103 Seminar-Zoology****Credit:** 1 (0-0-1)

Student-led reviews of current scientific literature on various topics in zoology with critical class analyses. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** BIOL 3402 and BIOL 3408 or BIOL 3405 or BIOL 3401 and ENGL 2311 or ENGL 1302 must be completed first.**Restrictions:** Graduate level students may not enroll.**BIOL 4104 Seminar-Ecology****Credit:** 1 (0-0-1)

Student-led reviews of current scientific literature on various topics in ecology with critical class analyses. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** BIOL 3402, BIOL 3407, ENGL 2311 or ENGL 1302 must be completed first.**Restrictions:** Graduate level students may not enroll.

**BIOL 4106 Seminar in Health****Credit:** 1 (0-0-0)

Student-led reviews of current scientific literature and historic significance on topics in Health Sciences with critical class analyses. Students will refine their ability to search, read, understand, discuss and critique the primary scientific literature, both orally and in writing.

**Prerequisites:** BIOL 3402 and ENGL 2311 or ENGL 1302.**Restrictions:** Enrollment is limited to Undergraduate level students.**BIOL 4120 Experiential Lab Instruction****Credit:** 1 (0-0-1)

An introduction to laboratory instruction as an undergraduate teaching assistant. Duties will include curriculum development, preparation of laboratory exercises, weekly experimental instruction and weekly meetings with the faculty mentor. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** An earned B or above in the course of interest, and an application submitted for review.**Restrictions:** Graduate level students may not enroll.**Repeat Status:** Course may be repeated 1 time(s).**BIOL 4301 Astrobiology****Credits:** 3 (3-0-0)

Is life on Earth all there is? Is there life elsewhere in the solar system or beyond, on planets orbiting distant stars? These are fundamental questions of the human condition, but a growing knowledge of environmental conditions on other planets, the discovery of thousands of planets in other star systems and a deeper (literally in some cases) understanding of life under extreme conditions here on Earth allow us to explore them on multiple levels. After an introduction to astronomy and the geological history of the Earth, this course will focus on the cell biology, ecology and evolution of extremophiles on Earth. We will then use that understanding to investigate other possible sites for life elsewhere in the universe. This will be a seminar style course using primary literature, established texts, and even science fiction to engage with the material.

**Prerequisites:** BIOL 1306, BIOL 1307.**Restrictions:****BIOL 4304 Undergrad Research in Biology****Credits:** 1-3 (1-1-0)

This course provides an independent review opportunity that will allow undergraduates majoring in biology to make an original intellectual contribution to the discipline. Research will be conducted in collaboration with a faculty mentor. Variable credit for a total of 3 maximum. Recommended: BIOL 3104. Approval of instructor is required. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** Instructor approval and BIOL 1306, BIOL 1106, BIOL 1307, BIOL 1107.**Restrictions:** Enrollment limited to students with a semester level of Junior or Senior. Graduate level students may not enroll.**BIOL 4307 Conserv/Restoration Ecology****Credits:** 3 (3-0-0)

This course gives the student an introduction into Conservation Biology from a conceptual perspective together with its many applications in the preservation, protection, and sustainable stewardship of life in all Ecosystems. The course will also review policy, strategies and case studies based on past and current issues. In addition to conservation, the student will be introduced to Restoration Biology. Restoration and Reclamation will be introduced as a follow up step of Conservation through the analysis of case studies where human intervention affected the outcome of an ecosystem. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** BIOL 3407.**Restrictions:** Graduate level students may not enroll.**BIOL 4356 Topics in Biology****Credits:** 3 (3-0-0)

Lectures in selected topics. May be repeated for credit once under a different topic. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** BIOL 2411.**Restrictions:** Graduate level students may not enroll.**Repeat Status:** Course may be repeated 1 time(s).**BIOL 4360 Internship in Biology****Credits:** 3 (0-0-3)

Internship in Biology is a course aimed at providing professional working experience in the field of biology. The sites at which students will be interns will be local and may be affiliated with the government, military, or private foundations. The student will be required to be a model employee and an exemplary ambassador of Texas A&M University-San Antonio. Students will be supervised by a site manager and by a faculty member. Students will be evaluated based on their work performance and a reflection paper describing their experience. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** BIOL 1306, BIOL 1106, BIOL 1307, and BIOL 1107.**Restrictions:** Graduate level students may not enroll.**BIOL 4401 Molecular Biology****Credits:** 4 (3-3-0)

This course focuses in depth on the molecular basis of life (DNA, RNA, and proteins) and the biochemical mechanisms that control expression of information in the cell. Emphasis will be on molecular techniques and experimental data analysis. With laboratory section. Recommended: CHEM 2325. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** BIOL 2411 and BIOL 2421 or with instructor permission.**Restrictions:** Graduate level students may not enroll.**BIOL 4402 Developmental Biology****Credits:** 4 (3-3-0)

Developmental Biology is the study of how a single cell develops into a multicellular differentiated organism. Cell signaling pathways involved and the interface between evolution and development will be a primary focus. The laboratory experience will address pathways controlling development in model organisms. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** A passing grade of C or better in BIOL 2411.**Restrictions:** Graduate level students may not enroll.

**BIOL 4406 Bacteriology****Credits:** 4 (3-3-0)

This course studies the diversity of the bacterial world, including the array of metabolic pathways used by different species of bacteria to inhabit a wide range of environments. Emphasis will be on mechanisms of controlling gene expression in prokaryotes, biochemical pathways of energy production and consumption, culture techniques and diagnostic methods, and use of bacteria in research. With laboratory section. Recommended: CHEM 2323. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** BIOL 2411, 2421, CHEM 1312/1112.**Restrictions:** Graduate level students may not enroll.**BIOL 4407 Virology****Credits:** 4 (3-3-0)

The emphasis of this course is an over-view of viruses and host-virus interactions at the molecular and cellular level, and includes an overview of development of antiviral therapies and utilization of viral vector for gene therapy and vaccines. The mandatory recitation section will involve in-class or online discussion, evaluation, and presentation of peer-reviewed journal articles on the topic of Virology. With laboratory section. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** A passing grade of C or better in BIOL 2411 or BIOL 2421.**Restrictions:** Graduate level students may not enroll.**BIOL 4408 Immunology****Credits:** 4 (3-3-0)

Fundamental concepts in Immunology covering molecular and cellular immunology as well as applied aspects.

**Prerequisites:** BIOL 2411 TSI Restriction(s): Reading, Math, and Writing**Restrictions:** Graduate level students may not enroll.**BIOL 4409 Biology of Disease Vectors****Credits:** 4 (3-1-0)

Biology of Disease Vectors the biology and ecology of arthropods that transmit medically important diseases. Students will gain an understanding of the complex relationship between vectors and the pathogens they transmit, specifically the physiological, evolutionary, and ecological relationship. Students will also learn applied and epidemiological aspects of this complex relationship. A mandatory recitation is associated with this course. Recommended: BIOL 3407 and BIOL 3402. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** A passing grade of C or better in BIOL 1307 and 1107, BIOL 2411 or ENGL 2311, and at least 9 hours of BIOL credit hours.**Restrictions:** Graduate level students may not enroll.**BIOL 4410 Topics in Biology****Credits:** 4 (3-3-0)

Lectures, literature investigation and research in selected topics. With laboratory section. May be repeated for credit once under different topic. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** BIOL 2411.**Restrictions:** Graduate level students may not enroll.**Repeat Status:** Course may be repeated 1 time(s).**BIOL 4411 Appl Plant Physiology,Grwth/Dv****Credits:** 4 (3-3-0)

This course provides students an applied approach to how plants function, grow and develop in response to environmental challenges. It also addresses the physical and chemical principles that underlie physiological processes. The application of this knowledge in the context of current issues such as drought and food shortage will be addressed. The weekly laboratory session will complement the lecture, by providing hands-on experience in observation, data collection, measurement, and problem-solving skills. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** A passing grade of C in BIOL 1307 and BIOL 1107.**Restrictions:** Graduate level students may not enroll.**BIOL 4423 Wildlife Management****Credits:** 4 (3-3-0)

This course introduces the student to the fundamental components that are involved in wildlife management. We will approach the study of wildlife management by reviewing important ecological principles, understand the significance of conservation in wildlife management, and identify how various management efforts may be applied for sustainable wildlife populations. With laboratory section. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** BIOL 3407.**Restrictions:** Graduate level students may not enroll.**BIOL 4424 Field Biology****Credits:** 4 (3-3-0)

During this course the student will learn to plan an ecological study and conduct fieldwork. The student will be introduced to different experimental designs and procedures to study different types of organisms and their environment. With Laboratory Section. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** BIOL 3407.**Restrictions:** Graduate level students may not enroll.**BIOL 4425 Ornithology****Credits:** 4 (3-3-0)

Classification, structures, physiology, natural history and field identification of birds. This course may require early morning field trips. With laboratory section. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** BIOL 1307.**Restrictions:** Graduate level students may not enroll.**BIOL 4427 Herpetology****Credits:** 4 (3-3-0)

Evolution, anatomy, physiology, behavior, and ecology of amphibians and reptiles from a world-wide perspective. With laboratory section in which local forms will be emphasized. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** BIOL 1307.**Restrictions:** Graduate level students may not enroll.

**BIOL 4429 Mammalogy****Credits:** 4 (3-3-0)

Classification, distribution, life histories, economic importance, techniques of field study, methods of collection and preservation of mammals. With laboratory section. Recommended: BIOL 3405. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** A passing grade of C or better in BIOL 1307 and 1107.**Restrictions:** Graduate level students may not enroll.**BIOL 4430 Parasitology****Credits:** 4 (3-3-0)

Introduction to parasitism with special reference to human and other vertebrate hosts. With laboratory section. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** An earned grade of C or better in BIOL 1307 and BIOL 1107.**Restrictions:** Graduate level students may not enroll.**BIOL 4431 Ichthyology****Credits:** 4 (3-3-0)

Evolution, anatomy, physiology, behavior, and ecology of fishes from a world-wide perspective. With laboratory section in which local forms will be emphasized. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** BIOL 1307.**Restrictions:** Graduate level students may not enroll.**BIOL 4432 Primatology****Credits:** 4 (3-3-0)

An introduction to the diversity, distribution, evolutionary history and ecological importance of primates. This course will emphasize the evolutionary and ecological principles underlying our understanding of primate behavior and how these principles inform us about our own behavior. With laboratory section. TSI Restriction(s): Reading, Math, and Writing

**Prerequisites:** An earned C or better in BIOL 1307 and BIOL 1107.**Restrictions:** Graduate level students may not enroll.**BIOL 5101 Independent Study****Credit:** 1 (0-0-1)

Independent study projects provide research experience and academic credit for laboratory, field work, or theoretical research. Independent study projects may be done with any faculty in the biological sciences.

**Restrictions:** Enrollment is limited to Graduate level students.**Repeat Status:** Course may be repeated 11 time(s).**BIOL 5105 Graduate Seminar****Credit:** 1 (1-0-0)

This course provides graduate students with an opportunity to explore current primary research across a variety of biological disciplines. This seminar will use a variety of modalities including journal club style review of literature, invited talks by leading biologists and proposal presentations by the students to evaluate current topics in biology.

**Restrictions:** Enrollment is limited to Graduate level students.**Repeat Status:** Course may be repeated 5 time(s).**BIOL 5201 Independent Study****Credits:** 2 (0-0-2)

Independent study projects provide research experience and academic credit for laboratory, field work, or theoretical research. Independent study projects may be done with any faculty in the biological sciences.

**Restrictions:** Enrollment is limited to Graduate level students.**Repeat Status:** Course may be repeated 5 time(s).**BIOL 5301 Independent Study****Credits:** 3 (0-0-3)

Independent study projects provide research experience and academic credit for laboratory, field work, or theoretical research. Independent study projects may be done with any faculty in the biological sciences.

**Restrictions:** Enrollment is limited to Graduate level students.**Repeat Status:** Course may be repeated 3 time(s).**BIOL 5303 Ecosystems Ecology****Credits:** 3 (3-0-0)

This course will help students understand the physical, chemical and biological processes regulating the dynamics of terrestrial and aquatic ecosystems. We will review theory, discussion of key scientific papers and analysis of case studies. Students will develop a more in depth understanding of ecosystem organization and function over time. We will trace the interconnectedness between anthropogenic or natural disturbance on ecosystem processes such as nutrient transfer and its role on ecosystem composition. Students will also understand how theoretical concepts and models are applied in management and restoration of ecosystems from belowground-aboveground linkages to global change.

**Restrictions:** Undergraduate level students may not enroll.**BIOL 5306 Thesis****Credits:** 3 (0-0-3)

Research contributing to the graduate degree program.

**Restrictions:** Enrollment is limited to Graduate level students.**Repeat Status:** Course may be repeated 3 time(s).**BIOL 5309 Biology of Disease****Credits:** 3 (3-0-0)

This course will examine the molecular and cellular basis that underlie common infectious and noninfectious diseases of humans as well as mechanisms of transmission and epidemiology. The etiology and progression of the diseases will be discussed in addition to an understanding of experimental models and current therapeutic approaches. The infectious diseases covered will include those attributed to viral pathogens, prokaryotic pathogens, eukaryotic pathogens, and prions. The noninfectious diseases investigated include diabetes, cardiovascular disease, obesity, stroke, neurological diseases, and cancer.

**Restrictions:** Enrollment is limited to Graduate level students.**BIOL 5310 Graduate Scientific Scholarship****Credits:** 3 (3-0-0)

This course provides graduate students with an introduction to biological research methods including scientific ethics, writing, and citation, and grant writing.

**Restrictions:** Enrollment is limited to Graduate level students.

**BIOL 5311 Molecular Ecology****Credits:** 3 (3-0-0)

Molecular ecology is an exciting field that is taking advantage of the rapid development of new techniques in molecular genetics, as well as advances in the theoretical and statistical approaches, to study fundamental processes in evolution and ecology. This course will use the application of genetic and genomic techniques to explore the interface of ecological physiology, population biology, community ecology, phylogeography, behavioral ecology and conservation genetics.

**Restrictions:** Enrollment is limited to Graduate level students.**BIOL 5315 Biostatistics I****Credits:** 3 (3-0-0)

This course is designed to introduce students to the fundamentals of experimental design, parameter estimation via sampling, and statistical inference. Emphasis will be placed on the selection and appropriate use of widely used statistical methods in the life sciences (e.g., t-tests, correlation, general linear modeling). Students will also learn the principles of model criticism and how to assess whether data meet the assumptions of a variety of inferential statistical approaches. Students will gain hands-on experience with statistical computing, with the goal of developing students' abilities to implement the methodologies covered in the course using a modern statistical computing environment (e.g., R; [www.r-project.org](http://www.r-project.org)).

**Restrictions:** Undergraduate level students may not enroll.**BIOL 5320 Biostatistics II****Credits:** 3 (3-0-0)

This course is designed to introduce students who have successfully completed Graduate Biostatistics I to advanced topics in statistical modeling that are commonly used in ecology and evolutionary biology. Initially, emphasis is placed on extending the general linear model in ways that incorporate random effects (i.e., mixed effect models) and/or allow for non-normal error terms (i.e., generalized linear models). Students will also be introduced to parametric and nonparametric models commonly applied to survival data and information theoretic approaches to model selection and model-based inference. Students will then receive an overview of some of the most commonly used multivariate methods in the life sciences before receiving an introduction to basic flow control and resampling with and without replacement.

**Restrictions:** Undergraduate level students may not enroll.**BIOL 5370 Special Graduate Topics in Bio****Credits:** 3 (3-0-0)

This course is designed to allow the program to add a specialized course that fits the needs and requirements of the cohort of graduate students but will not be a permanent elective course topic. Special topics courses allow the students and faculty to explore current new topics in the scientific field, to focus specialized training on a particular biological subfield, and/or provide specialized training in a unique subfield/topic that is currently not an elective.

**Restrictions:** Undergraduate level students may not enroll.**BIOL 5401 Independent Study****Credits:** 4 (0-0-4)

Independent study projects provide research experience and academic credit for laboratory, field work, or theoretical research. Independent study projects may be done with any faculty in the biological sciences.

**Restrictions:** Enrollment is limited to Graduate level students.**Repeat Status:** Course may be repeated 2 time(s).**BIOL 5404 Biotechnology****Credits:** 4 (3-1-0)

This course will explore the current use of biotechnology in biological research.

**Restrictions:** Enrollment is limited to Graduate level students.**BIOL 5405 Cellular Mechanisms****Credits:** 4 (3-1-0)

This course is the study of how different biochemical, metabolic, and molecular pathways of the cell work together to produce the many functions of cells such as movement, response to hormones, growth, protein synthesis, etc. The topics included in this course are transcription, translation, signal transduction pathways, protein targeting, secretion, endocytosis, cell death, cellular organization, and motility. Prokaryotic and eukaryotic mechanisms will be discussed when applicable. Cell-cell interactions and tissue formation will be discussed, including the loss of cell division control leading to cancer.

**Restrictions:** Enrollment is limited to Graduate level students.**BIOL 5406 Population & Community Ecology****Credits:** 4 (3-1-0)

This course provides an advanced view of the concepts that underlie the spatial and temporal dynamics of populations and the communities within which they are embedded using mathematical and graphical analysis and empirical investigations. Lectures will emphasize concepts and models. Readings from the primary literature will facilitate the student's abilities to critically evaluate the primary literature and will provide a historical perspective of the discipline. Topics to be covered will include population growth and regulation, species interactions, eco-evo dynamics, food webs, and patterns of diversity.

**Restrictions:** Enrollment is limited to Graduate level students.**BIOL 5470 Special Graduate Topics in Bio****Credits:** 4 (3-1-0)

This course is designed to allow the program to add a specialized course that fits the needs and requirements of the cohort of graduate students but will not be a permanent elective course topic. Special topics courses allow the students and faculty to explore current new topics in the scientific field, to focus specialized training on a particular biological subfield, and/or provide specialized training in a unique subfield/topic that is currently not an elective.

**Restrictions:** Undergraduate level students may not enroll.