

BIOL Biology

BIOL 1011K Introduction to Biology

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

An introduction to fundamental unifying principles in biology. Topics covered in the course include: chemistry of life, cell structure and membranes, cellular functions (metabolism, respiration, photosynthesis, communication, and reproduction), genetics (inheritance patterns, DNA structure and function, gene expression, and biotechnology), and evolution. This course involves both lecture and lab components.

BIOL 1103 Concepts of Biology

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

May include topics such as evolution, ecology and the environment, genetics and heredity, diversity of life, cells and cellular energy, biomolecules, and the scientific process. (Credit in this non-majors course may not be applied to the Area F requirement in biology. Course not intended for science majors or clinical health majors).

BIOL 1103L Concepts of Biology Laboratory

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

Laboratories that teach the basic principles of biology and their relevance to biological issues (e.g., disease, food safety, genetic modification, cloning, resistance to antibiotics, evolution, plant resources, and forensic science). Guided inquiry laboratory activities emphasize the scientific method of inquiry and promote the development of observation, analysis, and communication skills. Credit toward graduation will not be granted for both BIOL 1103L and BIOL 1110L.

BIOL 1107 Principles of Biology I

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

This course covers foundational concepts in molecular and cellular biology. Topics include the scientific method, organic macromolecules, cell structure and function, respiration, photosynthesis, cell division, and the flow of information from DNA to proteins. Requires a minimum grade of C to serve as prerequisite to higher-level BIOL courses.

Prerequisite(s): Prior or concurrent enrollment in all of the following: ENGL 1101, and MATH 1001 or MATH 1101 or MATH 1111.

Corequisite(s): BIOL 1107L.

BIOL 1107L Principles of Biology I Laboratory

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

Laboratory course emphasizing an experimental approach to learning major principles of molecular and cellular biology. Requires a minimum grade of C to serve as prerequisite to higher-level BIOL courses.

Prerequisite(s): Prior or concurrent enrollment in MATH 1111 or MATH 1001 or MATH 1113 and ENGL 1101.

Corequisite(s): BIOL 1107.

BIOL 1108 Principles of Biology II

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

An introduction to evolution and its role in creating biodiversity. Students will explore how evolution creates a hierarchical pattern of shared ancestry among all living things. Topics include natural selection and evolutionary change, speciation, phylogeny and classification, and the structure and function of the major forms of life (domains, kingdoms, and major phyla). Requires a minimum grade of C to serve as prerequisite to higher-level BIOL courses.

Prerequisite(s): A minimum grade of "C" in BIOL 1107 and BIOL 1107L.

Corequisite(s): BIOL 1108L.

BIOL 1108L Principles of Biology Laboratory II

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

Laboratory survey of evolution and biodiversity, including natural selection, principles of classification, and the structure and function of the major forms of life (domains, kingdoms, and major phyla). Requires a minimum grade of C to serve as prerequisite to higher-level BIOL courses.

Corequisite(s): BIOL 1108.

BIOL 1110L Concepts of Biology Trad. Lab

1 Credit Hour. 0 Lecture Hours. 2 Lab Hours.

Laboratories that teach the basic principles of biology and their relevance to biological issues (e.g., disease, food safety, genetic modification, cloning, resistance to antibiotics, evolution, plant resources, and forensic science). Laboratory and field activities emphasize the scientific method of inquiry and promote the development of observation, analysis, and communication skills. Credit toward graduation will not be granted for both BIOL 1103L and BIOL 1110L.

BIOL 1230 Environmental Biology

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

A survey of environmental issues from a biological perspective. The course will provide an introduction to environmental science, population growth, communities and ecosystems, evolution and biodiversity, and the fundamental interactions of humans with their environment (land, water, energy, food, and climate).

BIOL 1230L Environmental Biology Lab

1 Credit Hour. 0 Lecture Hours. 2 Lab Hours.

Laboratories that teach the basic concepts of environmental biology and ecology, and their relevance to current environmental concerns (e.g., biodiversity loss, climate change, invasive species, energy use, water resources, air pollution, sustainability). Laboratory and field activities emphasize the scientific method of inquiry and promote the development of observation, analysis, and communication skills.

BIOL 1320 Diversity of Life

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

Survey of the major domains of life, including prokaryotic and eukaryotic groups, as well as viruses.

Prerequisite(s): Prior or concurrent enrollment in ENGL 1101.

BIOL 1330 Human Biology

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

Structure and function of human organ systems, human heredity, evolution, and ecology.

Prerequisite(s): Prior or concurrent enrollment in ENGL 1101.

BIOL 1331 Insects and People

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

An introduction to the role insects and other arthropods serve in relation to humans. Insect human interactions in the home, yard, garden, workplace, recreational areas, and human body are included. Considerations of the natural history, life cycles and optional human actions regarding pests, beneficial insects, insects and disease, insects and food, and aesthetics is included.

BIOL 1335 Plants and Civilization

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

An introduction to major groups of economic plants and their role in the origin and maintenance of civilization. The course also deals with plant biodiversity and the potential impact of biological losses.

BIOL 2010 Principles of Microbiology

4 Credit Hours. 3 Lecture Hours. 0 Lab Hours.

Genetics, classifications and methods of control of bacteria, fungi, protozoa and viruses, with introduction to medical, industrial and environmental microbiology. Students receiving credit for this course may not receive credit for BIOL 4240. (Not intended for pre-health professions students.)

Prerequisite(s): BIOL 1108 and BIOL 1108L, and CHEM 1211K, or CHEM 1211 & CHEM 1211L.

BIOL 2010L Microbiology Lab

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

Corequisite(s): BIOL 2010.

BIOL 2081 Human Anatomy and Physiology I
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.

Gross anatomy, histology and physiology of human organ systems. Requires a minimum grade of C to serve as prerequisite to higher-level BIOL courses. (Non-majors course intended for health professions students.)

Prerequisite(s): BIOL 1107 and BIOL 1107L or a minimum grade of "C" in CHEM 1151 and CHEM 1211K or CHEM 1211 and CHEM 1211L.

Corequisite(s): BIOL 2081L.

BIOL 2081L Human Anatomy and Physiology I Laboratory
1 Credit Hour. 0 Lecture Hours. 3 Lab Hours.

A laboratory designed to instruct and give students experience with lab safety, use of a microscope, cells and their parts, cell division, tissues, the integumentary system, skeletal system, muscular system, and nervous system. Requires a minimum grade of C to serve as prerequisite to higher-level BIOL courses. (Non-majors course intended for health professions students.)

Corequisite(s): BIOL 2081. Cross Listing(s): KINS 2511.

BIOL 2082 Human Anatomy and Physiology II
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.

A continuation of BIOL 2081. Anatomy, histology, and physiology of human organ systems. Requires a minimum grade of C to serve as prerequisite to higher-level BIOL courses. (Non-majors course intended for health professions students.)

Prerequisite(s): BIOL 2081.

Corequisite(s): BIOL 2082L.

Cross Listing(s): KINS 2532.

BIOL 2082L Human Anatomy and Physiology II Laboratory
1 Credit Hour. 0 Lecture Hours. 3 Lab Hours.

A laboratory designed to instruct students on the form and function of the circulatory system, lymphatic system, respiratory system, digestive system, urinary system and reproductive system. Requires a minimum grade of C to serve as prerequisite to higher-level BIOL courses. (Non-majors course intended for health professions students.)

Corequisite(s): BIOL 2082.

Cross Listing(s): KINS 2512.

BIOL 2099 Special Topics in Biology

4 Credit Hours. 0-3 Lecture Hours. 0-3 Lab Hours.

Course taught on a special topic in biology on a one-time basis.

Prerequisite(s): Permission of instructor.

BIOL 2120 Plant Biology

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

Evolution and diversity of plants, including comparative morphology, anatomy, physiology, growth and development, and reproduction. Plants will be examined at the cellular, organismal, and community levels.

Laboratories may include field trips. Students may not count both BIOL 2120 and BIOL 3535 toward the Biology major.

Prerequisite(s): BIOL 1108 and BIOL 1108L.

BIOL 2240 Microbiology

4 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.

Emphasizes fundamental principles of microbiology. Topics include structure, physiology, and economic importance of microorganisms. (Non-majors course intended for health professions students.)

BIOL 2275 Microorganisms and Disease

4 Credit Hours. 3 Lecture Hours. 0 Lab Hours.

Morphology, genetics, physiology, and public health importance of microorganisms with emphasis on bacterial pathogens.

Prerequisite(s): A minimum grade of "C" in BIOL 2082 and 2082L.

BIOL 2275L Micro-Organisms/Disease Lab

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

Corequisite(s): BIOL 2275.

BIOL 2320 Research Methods Biology

2 Credit Hours. 2 Lecture Hours. 0 Lab Hours.

Provides Departmental Honors in Biology students an overview of basic research methods, experimental design, visual presentation and analysis of biological information in diversity of biology sub-disciplines. This course provides the foundation for understanding the analyses typically presented in biological publications as well as the precepts necessary to plan a research project effectively.

Prerequisite(s): BIOL 1011K and acceptance into the Departmental Honors in Biology Program is required.

BIOL 3099 Selected Topics in Biology

1-4 Credit Hours. 1-3 Lecture Hours. 0,3 Lab Hours.

Course taught on a selected topic in biology on a one time basis.

Prerequisite(s): BIOL 1108 and BIOL 1108 and CHEM 1211K or CHEM 1211 and CHEM 1211L.

BIOL 3100 People and the Environment

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

Interactions between humans and the support systems of the earth which are essential to their existence. Not for credit as a biology major elective.

Prerequisite(s): BIOL 1107.

BIOL 3131 Physiology

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

This course is an introduction to the fundamental principles of physiology. The focus is on how organisms maintain homeostasis in the face of changes in their internal and external environment. This course will cover energetics, the basic physiological processes of cells, how cell signaling can coordinate more elaborate functions, the hierarchical organization of cells into organs and organ systems, and how these organ systems can carry out complex adaptive functions. Students will see the fundamental relationship between structure and function and learn how physiological systems are constrained by phylogeny, physical limits, and functional trade-offs. Requires a minimum grade of C to serve as prerequisite to higher-level BIOL courses.

Prerequisite(s): BIOL 1108, BIOL 1108L; CHEM 1211K, or (CHEM 1211 and CHEM 1211L).

BIOL 3133 Evolution and Ecology

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

An introduction to major principles of evolution and ecology. This course covers the origin and maintenance of genetic variation, genetic change in populations over time (microevolutionary processes of selection, drift, and gene flow), and taxonomic diversification (macroevolutionary process of speciation). Students will see how this evolution and diversification are shaped by ecological interactions between organisms and their abiotic and biotic environment. These ecological interactions will be studied at the population, community, and ecosystem levels. Requires a minimum grade of C to serve as prerequisite to higher-level BIOL courses.

Prerequisite(s): BIOL 1108 and BIOL 1108L; CHEM 1211K or (CHEM 1211 & CHEM 1211L).

BIOL 3134 Cell and Molecular Biology

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

An introduction to cell structure and biochemistry. Topics may include gene regulation; bioenergetics; catalysis; cellular metabolism; cell evolution; genetic engineering; protein synthesis, structure and function. Requires a minimum grade of C to serve as prerequisite to higher-level BIOL courses.

Prerequisite(s): BIOL 1108 and BIOL 1108L and CHEM 1211K or CHEM 1211 and CHEM 1211L.

BIOL 3440 Field Biology

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

Field study of the basic natural history of plants and/or animals of the southeastern United States. Lectures, laboratories, and field trips emphasize the ability to locate, observe, collect, and identify organisms in the field, as well as manage field data.

Prerequisite(s): BIOL 1108 and BIOL 1108L.

BIOL 3535 Botany**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

An introduction to the biology of plants. Topics include the evolution and diversity of plants, as well as the unique morphology, physiology, reproduction and ecology of higher plants in particular. Students may not count both BIOL 2120 and BIOL 3535 toward the Biology major.

Prerequisite(s): BIOL 1108 and BIOL 1108L.**BIOL 3610 Topics in Life Science for Educators****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

A survey of life sciences including topics such as biochemistry, cellular structure and function, DNA and protein synthesis, genetics and evolution, animal structure and function, the kingdoms of life, and principles of ecology. Admission to the College of Education and two courses in science, including one lab course. Open only to students in middle grades science track.

BIOL 3611 Research Methods Seminar**1 Credit Hour. 1 Lecture Hour. 0 Lab Hours.**

Students read and discuss scientific literature in advance of professional seminar presentations, attend and participate in seminar presentations, and write reflective summaries. Students practice reading scientific literature, discuss commonly employed methods of data analysis, and experience the dissemination of science through seminar presentations. The course may be repeated up to two times for additional credit.

Prerequisite(s): BIOL 1108 and BIOL 1108L.**BIOL 3630 Current Trends in Biol. Res.****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Provides students in Departmental Honors in Biology with a structured introduction to current topics in biological research. The course familiarizes students with the scope of biological research and aids students in selecting an area of inquiry to pursue their capstone research requirement. Students will attend the Departmental Seminar series as part of this course. One outcome of this course is a research proposal written with a faculty mentor. Students may not receive credit for this course and BIOL 4620.

Prerequisite(s): BIOL 1011K and acceptance into the Departmental Honors in Biology Program is required.**BIOL 3790 Teaching Internship in Biology****1-3 Credit Hours. 0 Lecture Hours. 0 Lab Hours.**

Student internship in teaching under the mentorship of a faculty member. The student will participate in a workshop immediately prior to the start of the semester, intern in a designated Biology course, and meet with the faculty mentor one hour each week.

Prerequisite(s): BIOL 1108 and BIOL 1108L.**BIOL 4130 Genetics****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

This course is a broad survey of the principles of inheritance, including the study of gene structure, gene function, and the role of genes in determining the traits of living organisms. Topics include the molecular structure of DNA/RNA, replication, transcription, translation, interaction of genes, linkage and mapping, sex linkage, regulation of gene expression, and Mendelian and non-Mendelian inheritance.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**BIOL 4150 Horticulture****4 Credit Hours. 3 Lecture Hours. 2 Lab Hours.**

Basic gardening principles with emphasis on plant growth and development as responses to environmental conditions; plant classification, growth and development, environment, propagation, disease, pest control.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134 and BIOL 2120 or BIOL 3535.**Corequisite(s):** BIOL 4150L.**BIOL 4230 Introduction to Immunology****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Introduction to the biology of lymphocytes and adaptive immune response including the study of immunoglobulins and cytokines. The roles of the immune system in health and disease are also examined.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**BIOL 4240 Biology of Microorganisms****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Covers the principles and techniques of general microbiology, including physiology, genetics, and host-parasite interactions involving bacteria, eukaryotic microorganisms and viruses.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**BIOL 4310 Applied Microbiology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Microbiological aspects of food, milk, water, domestic wastes, and industry.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**BIOL 4320 Environmental Microbiology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Principles of microbial ecology that may include biogeochemical cycling, symbiotic relationships, and microbial life in various terrestrial and aquatic habitats. Laboratory will cover methods to study the diversity, phylogeny, and metabolism of Bacteria and Archaea.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**BIOL 4450 Human Embryology****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Topics will include development of the male and female reproductive systems and gamete formation, the process of fertilization, implantation, and the formation of the placenta. Development of the germ cell layers and subsequent development of the major organ systems will be covered with emphasis on the cardiovascular system, respiratory system, digestive system, urogenital system, limb formation, and neurologic system. The most common pediatric congenital defects associated with these systems will also be discussed and clinical examples provided.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**BIOL 4470 Sea Turtle Biology****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Vertebrate anatomy, embryology, migration, population genetics, conservation and management of sea turtles and other threatened or endangered species.

Prerequisite(s): Completion of BIOL 3131 and BIOL 3133 and BIOL 3134.**BIOL 4520 Medical Microbiology****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Disease causing microbes, their diagnosis, pathogenesis, and epidemiology.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**BIOL 4530 Natural History of the Vertebrates****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Life history and functional biology of major vertebrate groups. Emphasis on behavioral, reproductive and feeding adaptations using case studies. Labs focus on field identification of native species.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**BIOL 4532 Evolution****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

"Covers the historical development of evolutionary thought and focuses on current issues in evolution. Emphasis is placed on the perceived importance of natural selection, mechanisms of speciation, the history of life on Earth, and human evolution.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.

BIOL 4535 Vertebrate Zoology**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

An introduction to the evolution, structure, and function of the vertebrates. This course will trace the origin of vertebrates from their invertebrate ancestors and explore how basic vertebrate design has evolved in the major vertebrate groups. Students will also learn how vertebrate structure has affected their function, distribution, behavior, and ecology.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**BIOL 4540 Principles of Ecology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Reviews basic ecological principles and current hypotheses relevant to biological organisms from the level of the population to ecosystems. Application of mathematic models to biological processes is emphasized.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**BIOL 4541 Invertebrate Zoology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

A survey of the diversity and basic biology of the invertebrate animal phyla by comparing the body plans, life histories, and ecology of a range of representative species. Emphasis is placed on adaptations responsible for the diversity and life history strategies of invertebrates, and identifications of locally important invertebrate groups. Students may not count both BIOL 3630H and BIOL 4620 toward the Biology major.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**BIOL 4550 Biology of Marine Organisms****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Relationship between organisms and abiotic and biotic features of the marine environment, with emphasis on local marine ecosystems. Field labs.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Corequisite(s):** BIOL 4550L.**BIOL 4550L Marine Organisms Lab****0 Credit Hours. 0 Lecture Hours. 4 Lab Hours.****Corequisite(s):** BIOL 4550.**BIOL 4620 Undergraduate Seminar Undergraduate Seminar****2 Credit Hours. 2 Lecture Hours. 0 Lab Hours.**

Group study of selected biological topics held in conjunction with the normal seminar schedule of the Department of Biology. Topics will vary each semester and will be led by biology faculty.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134 and Junior standing in Biology Program is required.**BIOL 4635 Biological Basis of Animal Behavior****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

This course will cover the biological basis of animal behavior, emphasizing the evolution, function, development and causes of behavioral actions by animals. Classes will be interactive and include student discussions. Video clips will illustrate behavioral concepts discussed in the course. A range of topics will be covered, including such possibilities as communication, predator/prey interactions, reproductive behavior, the interaction of genes and the environment, the development of behavior and sensory mechanisms.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**BIOL 4730 Internship in Biology****1-3 Credit Hours. 0 Lecture Hours. 3-9 Lab Hours.**

Qualified biology majors may acquire practical experience by working with a public or private agency that specializes in the proposed area of study. A faculty member in the biology department will act as advisor. Internships must be approved by the head of the department, and a poster presentation of the results must be presented at the end of the semester.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**BIOL 4890 Research****1-4 Credit Hours. 0 Lecture Hours. 0 Lab Hours.**

Biology majors will be encouraged to conduct a research project under the supervision of faculty. The faculty recommendation must have approval of the head of the biology department. A written abstract and an oral presentation of the results by the student must be presented at the end of the semester.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**BIOL 4895 Honors Research****1-3 Credit Hours. 0 Lecture Hours. 0 Lab Hours.**

Independent research under the guidance of a biology faculty member for students in the Departmental Honors program. Required for students attempting to earn Departmental Honors in Biology. Students may register for 1-3 credit hours, but must complete 4 credit hours. Students opting to attempt the honors degree program would be precluded from receiving biology elective credit for BIOL 4890.

BIOL 4999 Honors Thesis**2 Credit Hours. 2 Lecture Hours. 0 Lab Hours.**

Written and oral presentation of results of independent research. Honors thesis must follow the guidelines adopted by the University Honors Program. Required for students attempting to earn Departmental Honors in Biology.

BIOL 5099 Selected Topics/Biology**1-4 Credit Hours. 1-3 Lecture Hours. 0,3 Lab Hours.**

A course taught on a selected topic in biology on a one-time basis.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Cross Listing(s):** BIOL 5099G.**BIOL 5099G Selected Topics/Biology****1-4 Credit Hours. 1-3 Lecture Hours. 0,3 Lab Hours.**

Course taught on a selected topic in biology on a one-time basis. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5099.**BIOL 5100 Cell and Molecular Biology Lab****2 Credit Hours. 0 Lecture Hours. 6 Lab Hours.**

Laboratory research techniques in cell and molecular biology, with emphasis on inquiry-based projects, data analysis, and written and oral presentations.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134 and CHEM 3401.**Cross Listing(s):** BIOL 5100G.**BIOL 5100G Cell and Molecular Biology Laboratory****2 Credit Hours. 0 Lecture Hours. 6 Lab Hours.**

Laboratory research techniques in cell and molecular biology, with emphasis on inquiry-based projects, data analysis, and written and oral presentations. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5100.**BIOL 5110 Sensory Physiology****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

The anatomy and physiology of the major sensory systems - chemosensory, hearing, vision and the somatosensory tactile and pain systems, and how the sensory pathways are interpreted by the nervous system to affect perception and behavior. Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.

Cross Listing(s): BIOL 5110G.

BIOL 5110G Sensory Physiology**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

The anatomy and physiology of the major sensory systems - chemosensory, hearing, vision and the somatosensory tactile and pain systems, and how the sensory pathways are interpreted by the nervous system to affect perception and behavior. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor. Cross Listing(s): BIOL 5110.

BIOL 5120 Reproductive Biology**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Topics include the origin and maintenance of sexual reproduction, sexual selection among vertebrates, male and female reproductive anatomy and physiology and a survey of animal breeding systems across taxa.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Cross Listing(s):** BIOL 5120G.**BIOL 5120G Reproductive Biology****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Topics include the origin and maintenance of sexual reproduction, sexual selection among vertebrates, male and female reproductive anatomy and physiology and a survey of animal breeding systems across taxa. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5120.**BIOL 5131 Cell Biology****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Examines the structure and physiology of cells and subcellular organelles. Topics include the cell membrane and membrane transport, the extracellular matrix of the cell, the cell cytoskeleton, DNA structure and replication, transcription, translation and the regulation of gene expression.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Cross Listing(s):** BIOL 5131G.**BIOL 5131G Cell Biology****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Topics include the origin and maintenance of sexual reproduction, sexual selection among vertebrates, male and female reproductive anatomy and physiology and a survey of animal breeding systems across taxa. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5120.**BIOL 5132 Molecular Genetics****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Examines aspects of inheritance of organisms at the molecular, biochemical, and/or cellular levels.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Cross Listing(s):** BIOL 5132G.**BIOL 5132G Molecular Genetics****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Examines aspects of inheritance of organisms at the molecular, biochemical, and/or cellular levels. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5132.**BIOL 5141 Forensic Biology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Forensic biology is the marriage of biological sciences and the law. The extensive use of biological evidence has had a significant bearing on the course of law enforcement investigations in criminal and civil court proceedings. This course will introduce students to some of the basic concepts in forensic biology. Students should expect graphic imagery associated with actual forensic cases.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Cross Listing(s):** BIOL 5141G.**BIOL 5141G Forensic Biology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Forensic biology is the marriage of biological sciences and the law. The extensive use of biological evidence has had a significant bearing on the course of law enforcement investigations in criminal and civil court proceedings. This course will introduce students to some of the basic concepts in forensic biology. Graduate students will be required to complete advanced-level assignments beyond the scope of the undergraduate requirements. These assignments require a higher level of mastery in the subject matter with additional required deliverables representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5141.**BIOL 5142 Molecular Biotechniques Molecular Biotechniques****4 Credit Hours. 0,3 Lecture Hours. 0,3 Lab Hours.**

Highlights modern discoveries in molecular genetics and their application in today's world. In addition to the body of facts associated with molecular methodology, the course will introduce students to experimental techniques such as PCR, electrophoresis, restriction enzyme digest analysis, and DNA sequencing.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Cross Listing(s):** BIOL 5142G.**BIOL 5142G Molecular Biotechniques****4 Credit Hours. 0,3 Lecture Hours. 0,3 Lab Hours.**

Highlights modern discoveries in molecular genetics and their application in today's world. In addition to the body of facts associated with molecular methodology, the course will introduce students to experimental techniques such as PCR, electrophoresis, restriction enzyme digest analysis, and DNA sequencing. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5142.**BIOL 5148 Human Genetics****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Basic principles of Mendelian inheritance and molecular genetics are applied to a systematic review of human disorders. Included are disorders of blood, connective tissue, muscles, lysosomes, lipoproteins, transport membrane and mechanisms, amino acid metabolism and the immune system. Special attention is given to diseases caused by chromosomal abnormalities. Sex determination, genetic markers, gene mapping and population genetics are also covered.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Cross Listing(s):** BIOL 5148G.

BIOL 5148G Human Genetics**4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Basic principles of Mendelian inheritance and molecular genetics are applied to a systematic review of human disorders. Included are disorders of blood, connective tissue, muscles, lysosomes, lipoproteins, transport membrane and mechanisms, amino acid metabolism and the immune system. Special attention is given to diseases caused by chromosomal abnormalities. Sex determination, genetic markers, gene mapping and population genetics are also covered. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverable representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5148.**BIOL 5150 Cancer Biology****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

An introduction to carcinogenesis with an emphasis on the genetic, molecular, and cellular mechanisms regulating cancer initiation, progression, and metastasis.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Cross Listing(s):** BIOL 5150G.**BIOL 5150G Cancer Biology****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

An introduction to carcinogenesis with an emphasis on the genetic, molecular, and cellular mechanisms regulating cancer initiation, progression, and metastasis. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5150.**BIOL 5160 Plant Physiology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Physiologic processes occurring in plants and the conditions which affect these processes. Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134 and BIOL 2120 or BIOL 3535.

Cross Listing(s): BIOL 5160G.**BIOL 5160G Plant Physiology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Physiologic processes occurring in plants and the conditions which affect these processes. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5160.**BIOL 5200 Mammalian Physiology****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

General physiologic processes of mammals.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Cross Listing(s):** BIOL 5200G.**BIOL 5200G Mammalian Physiology****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

General physiologic processes of mammals. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5200.**BIOL 5230 Comparative Animal Physiology Comparative Animal Physiology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

A study of the physiology of animals within a comparative and integrative context. Selected topics include animal movement, circulation, respiration, osmoregulation, nervous and endocrine function and energetic metabolism. Laboratory will reinforce lecture content through inquiry-based activities.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Cross Listing(s):** BIOL 5230G.**BIOL 5230G Comparative Animal Physiology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

A study of the physiology of animals within a comparative and integrative context. Selected topics include animal movement, circulation, respiration, osmoregulation, nervous and endocrine function and energetic metabolism. Laboratory will reinforce lecture content through inquiry-based activities. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverable representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5230.**BIOL 5237 Physiological Ecology****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Examines how physiological adaptations of animals and plants to abiotic environmental factors (e.g., temperature, salinity, moisture, ultraviolet radiation) contribute to the understanding of local species diversity, biogeographic patterns, and habitat exploitation. Emphasis is placed on how physiological function (e.g., osmoregulation, thermoregulation, gas exchange, energy use) interfaces with ecology and evolutionary biology.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Cross Listing(s):** BIOL 5237G.**BIOL 5237G Physiological Ecology****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Examines how physiological adaptations of animals and plants to abiotic environmental factors (e.g., temperature, salinity, moisture, ultraviolet radiation) contribute to the understanding of local species diversity, biogeographic patterns, and habitat exploitation. Emphasis is placed on how physiological function (e.g., osmoregulation, thermoregulation, gas exchange, energy use) interfaces with ecology and evolutionary biology. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5237.**BIOL 5239 Neurobiology****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Introduction to the mechanisms of neural responses, neural integration, neural development, and environmental effects on developing mature nervous systems.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Cross Listing(s):** BIOL 5239G.**BIOL 5239G Neurobiology****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Introduction to the mechanisms of neural responses, neural integration, neural development, and environmental effects on developing mature nervous systems. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5239.

BIOL 5240 Histology**4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Examines the origin, development, structure and function of vertebrate tissues.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Cross Listing(s):** BIOL 5240G.**BIOL 5240G Histology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Examines the origin, development, structure and function of vertebrate tissues. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5240.**BIOL 5241 Comparative Vertebrate Anatomy****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

A comparative and functional study of the morphological systems of vertebrates. Laboratory emphasizes dissection of representative vertebrate groups.

Cross Listing(s): BIOL 5241G.**BIOL 5241G Comparative Vertebrate Anatomy****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

A comparative and functional study of the morphological systems of vertebrates. Laboratory emphasizes dissection of representative vertebrate groups. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5241.**BIOL 5242 Developmental Biology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

This course is an introduction to the principles of animal and plant development. The focus is on how male and female gametes fuse to form a zygote and how a single-celled zygote develops into an animal with multiple organs with specialized function. This course will cover the molecular and cellular mechanisms involved in fertilization and early embryonic development, molecular signaling involved in development of organs and organ systems, the concept of stem cells and regeneration, and cellular and molecular signaling mechanisms in plant development. Students will see the fundamental conservation of molecular and cellular mechanisms across animals and plants during development as an important example of evolution.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Cross Listing(s):** BIOL 5242G.**BIOL 5242G Developmental Biology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

This course is an introduction to the principles of animal and plant development. The focus is on how male and female gametes fuse to form a zygote and how a single-celled zygote develops into an animal with multiple organs with specialized function. This course will cover the molecular and cellular mechanisms involved in fertilization and early embryonic development, molecular signaling involved in development of organs and organ systems, the concept of stem cells and regeneration, and cellular and molecular signaling mechanisms in plant development. Students will see the fundamental conservation of molecular and cellular mechanisms across animals and plants during development as an important example of evolution. Graduate students will be required to complete advanced-level assignments beyond the scope of the undergraduate requirements. These assignments require a higher level of mastery in the subject matter with additional required deliverables representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5242.**BIOL 5243 Toxicology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

An introduction to the principles of toxicology with a focus on the toxicology of aquatic organisms. Topics include risk assessment, regulatory toxicology, mutagenesis, teratology, and toxicology of the nervous and reproductive systems.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Cross Listing(s):** BIOL 5243G.**BIOL 5243G Toxicology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

An introduction to the principles of toxicology with a focus on the toxicology of aquatic organisms. Topics include risk assessment, regulatory toxicology, mutagenesis, teratology, and toxicology of the nervous and reproductive systems. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5243.**BIOL 5246 Human Pathophysiology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

A selective survey of causes and effects of disease in humans at the molecular, cellular, and systemic level. Selected topics include cellular malfunctions, altered cell environments, cancer biology, and the pathophysiology of the nervous, endocrine, cardiovascular, pulmonary, and renal organ systems.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Cross Listing(s):** BIOL 5246G.**BIOL 5246G Human Pathophysiology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

A selective survey of causes and effects of disease in humans at the molecular, cellular, and systemic level. Selected topics include cellular malfunctions, altered cell environments, cancer biology, and the pathophysiology of the nervous, endocrine, cardiovascular, pulmonary, and renal organ systems. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5246.**BIOL 5247 Endocrinology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

A study of endocrine mechanisms, including their evolution and importance at various levels of biological organization.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Cross Listing(s):** BIOL 5247G.**BIOL 5247G Endocrinology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

A study of endocrine mechanisms, including their evolution and importance at various levels of biological organization. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5247.**BIOL 5248 Immunology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

A detailed study of the mammalian immune system emphasizing the experimental basis of current immunological theories. Topics include antigen antibody interactions, organization and expression of immunoglobulin genes, complement, major histocompatibility complex, antigen processing and presentation, and generation of humoral and cellular immune responses.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Cross Listing(s):** BIOL 5248G.

BIOL 5248G Immunology**4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

A detailed study of the mammalian immune system emphasizing the experimental basis of current immunological theories. Topics include antigen antibody interactions, organization and expression of immunoglobulin genes, complement, major histocompatibility complex, antigen processing and presentation, and generation of humoral and cellular immune responses. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5248.**BIOL 5250 Limnology****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Study of the physical, chemical, and biological aspects of lakes and the interrelationships of all three domains of life involved in nutrient and energy cycling in these ecosystems. Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.

Cross Listing(s): BIOL 5250G.**BIOL 5250G Limnology****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Study of the physical, chemical, and biological aspects of lakes and the interrelationships of all three domains of life involved in nutrient and energy cycling in these ecosystems. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor.

Cross Listing(s): 5250.**BIOL 5260 Invasive Species****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Ecological and economic consequences of invasive, non-native species with topics that include the history of introductions, ecological and evolutionary processes, and the control and prevention of biological invasions.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Cross Listing(s):** BIOL 5260G.**BIOL 5260G Invasive Species****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Ecological and economic consequences of invasive, non-native species with topics that include the history of introductions, ecological and evolutionary processes, and the control and prevention of biological invasions. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverable representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5260.**BIOL 5333 Emerging Diseases****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Study of the epidemiology of emerging and re-emerging human diseases throughout the world, but with emphasis on the situation in North America. New and resurging diseases caused by prions, viruses, bacteria, protozoa, fungi, arthropods, and helminths will be discussed, including some vector-borne and tropical diseases.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Cross Listing(s):** BIOL 5333G.**BIOL 5333G Emerging Diseases****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Study of the epidemiology of emerging and re-emerging human diseases throughout the world, but with emphasis on the situation in North America. New and resurging diseases caused by prions, viruses, bacteria, protozoa, fungi, arthropods, and helminths will be discussed, including some vector-borne and tropical diseases. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverable representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5333.**BIOL 5340 Plant Pathology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

A broad introduction to representative common plant diseases and disorders with emphasis on diagnoses, causes, epidemiology, and methods of control.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134; and BIOL 2120 or BIOL 3535.**Cross Listing(s):** BIOL 5340G.**BIOL 5340G Plant Pathology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

A broad introduction to representative common plant diseases and disorders with emphasis on diagnoses, causes, epidemiology, and methods of control. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5340.**BIOL 5341 Parasitology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

A study of the general principles of parasitism, with emphasis on morphology, classification, identification, and life cycles of parasites of vertebrates.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Cross Listing(s):** BIOL 5341G.**BIOL 5341G Parasitology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

A study of the general principles of parasitism, with emphasis on morphology, classification, identification, and life cycles of parasites of vertebrates. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5341.**BIOL 5343 Medical-Veterinary Entomology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

An intensive study of the role of arthropods in the transmission, dissemination and causation of diseases of humans and animals. Topics include identification of vector arthropods and associated diseases, ecology, and control.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Cross Listing(s):** BIOL 5343G.**BIOL 5343G Medical-Veterinary Entomology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Introduces the principles and methods of biosystematics. Speciation, bio-nomenclature, hierarchical taxonomic categories, systematic characters, molecular systematics, and phylogenetic analyses are discussed. Laboratories involve use of modern molecular techniques and computational analysis with a variety of software packages. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverable representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5343.

BIOL 5345 Systematic Biology**4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Introduces the principles and methods of biosystematics. Speciation, bio-nomenclature, hierarchical taxonomic categories, systematic characters, molecular systematics, and phylogenetic analyses are discussed. Laboratories involve use of modern molecular techniques and computational analysis with a variety of software packages.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Cross Listing(s):** BIOL 5345G.**BIOL 5345G Systematic Biology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Introduces the principles and methods of biosystematics. Speciation, bio-nomenclature, hierarchical taxonomic categories, systematic characters, molecular systematics, and phylogenetic analyses are discussed. Laboratories involve use of modern molecular techniques and computational analysis with a variety of software packages. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do.

Cross Listing(s): BIOL 5345.**BIOL 5346 Agroecology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Agroecology provides the theoretical and conceptual framework for sustainable agriculture with an emphasis on underlying environmental factors, crop plants and animals. Topics include biotic and abiotic factors influencing biodiversity, interaction and stability of agroecosystems, organic farming, agroforestry, energy-use in agriculture and ways to transition towards sustainability.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134; and BIOL 2120 or BIOL 3535.**Cross Listing(s):** BIOL 5346G.**BIOL 5346G Agroecology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Agroecology provides the theoretical and conceptual framework for sustainable agriculture with an emphasis on underlying environmental factors, crop plants and animals. Topics include biotic and abiotic factors influencing biodiversity, interaction and stability of agroecosystems, organic farming, agroforestry, energy-use in agriculture and ways to transition towards sustainability. Graduate students will be required to complete advanced-level assignments beyond the scope of the undergraduate requirements. These assignments require a higher level of mastery in the subject matter with additional required deliverables representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5346.**BIOL 5347 Fisheries Biology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Examines the principles and practices of fisheries management and fish conservation, built on a foundation of biology, ecology, and fisheries science, with emphasis on freshwater North American species and environments. Laboratory emphasizes applied methods for collection, analysis, and interpretation of fisheries data. Field trips are required.

Prerequisite(s): BIOL 3131, BIOL 3133, BIOL 3134.**Cross Listing(s):** BIOL 5347G.**BIOL 5347G Fisheries Biology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Examines the principles and practices of fisheries management and fish conservation, built on a foundation of biology, ecology, and fisheries science, with emphasis on freshwater North American species and environments. Laboratory emphasizes applied methods for collection, analysis, and interpretation of fisheries data. Field trips are required.

Cross Listing(s): BIOL 5347.**BIOL 5400 Barrier Island Ecology****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Covers the abiotic and biotic environment, flora, and fauna of coastal barrier island habitats with a focus on Georgia's barrier islands. Topics may include geological history, coastal processes, and ecological communities of barrier island habitats. Current threats and current and future coastal management techniques will be discussed.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Cross Listing(s):** BIOL 5400G.**BIOL 5400G Barrier Island Ecology****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Covers the abiotic and biotic environment, flora, and fauna of coastal barrier island habitats with a focus on Georgia's barrier islands. Topics may include geological history, coastal processes, and ecological communities of barrier island habitats. Current threats and current and future coastal management techniques will be discussed.

Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5400.**BIOL 5431 Virology****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

A survey of the biology of viruses, with emphasis on viral diversity, virus-host interactions, viral diseases of humans, animals and plants and uses of viruses in medicine, research and biocontrol.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Cross Listing(s):** BIOL 5431G.**BIOL 5431G Virology****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

A survey of the biology of viruses, with emphasis on viral diversity, virus-host interactions, viral diseases of humans, animals and plants and uses of viruses in medicine, research and biocontrol. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverable representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5431.**BIOL 5432 Deep Sea Environments****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

This course examines the current knowledge about hydrothermal systems in terms of their deep-sea environment and their geological and chemical makeup. Emphasis is placed on studying symbiotic relationships, reproductive biology, larval dispersal, thermal tolerances, sulfide and sensory adaptations by organisms found in non-vent, vent, and cold seep environments. Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134. Cross Listing(s): BIOL 5432G.

BIOL 5432G Deep Sea Environments**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

This course examines the current knowledge about hydrothermal systems in terms of their deep-sea environment and their geological and chemical makeup. Emphasis is placed on studying symbiotic relationships, reproductive biology, larval dispersal, thermal tolerances, sulfide and sensory adaptations by organisms found in non-vent, vent, and cold seep environments. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5432.

BIOL 5441 Mycology**4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Broad introduction to various taxonomic groups of Fungi, emphasizing morphology, taxonomy, evolution, physiology, and economic importance. Selected mycolic diseases and symbiotic relationships in nature will be explored. Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134. Cross Listing(s): BIOL 5441G.

BIOL 5441G Mycology**4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Broad introduction to various taxonomic groups of Fungi, emphasizing morphology, taxonomy, evolution, physiology, and economic importance. Selected mycolic diseases and symbiotic relationships in nature will be explored. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverable representative of graduate-level work, as determined by the instructor. Cross Listing(s): BIOL 5441.

BIOL 5442 Entomology**4 Credit Hours. 0,3 Lecture Hours. 0,3 Lab Hours.**

Examines the phylogeny, morphology, life history and ecology of insects. Identification of local species will be emphasized. Field trips required. Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134. Cross Listing(s): BIOL 5442G.

BIOL 5442G Entomology**4 Credit Hours. 0,3 Lecture Hours. 0,3 Lab Hours.**

Examines the phylogeny, morphology, life history and ecology of insects. Identification of local species will be emphasized. Field trips required. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverable representative of graduate-level work, as determined by the instructor. Cross Listing(s): BIOL 5442.

BIOL 5443 Plant Taxonomy**4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

This course teaches the identification and taxonomy of the vascular plants, with an emphasis on the southeastern United States. Lectures, laboratories, and field trips cover the evolution, classification, identification, collection, and preservation of vascular plants. Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134; and BIOL 2120 or BIOL 3535. Cross Listing(s): BIOL 5443G.

BIOL 5443G Plant Taxonomy**4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

This course teaches the identification and taxonomy of the vascular plants, with an emphasis on the southeastern United States. Lectures, laboratories, and field trips cover the evolution, classification, identification, collection, and preservation of vascular plants. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverable representative of graduate-level work, as determined by the instructor. Cross Listing(s): BIOL 5443.

BIOL 5444 Ichthyology**4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Emphasizes the systematics, evolution, biology, ecology and behavior of recent and extinct fishes. Laboratory emphasizes the identification, morphology, and natural history of fishes. Field trips required. Cross Listing(s): BIOL 5444G.

BIOL 5444G Ichthyology**4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Emphasizes the systematics, evolution, biology, ecology and behavior of recent and extinct fishes. Laboratory emphasizes the identification, morphology, and natural history of fishes. Field trips required. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor. Cross Listing(s): BIOL 5444.

BIOL 5445 Herpetology**4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Examines the phylogeny, morphology, life history and ecology of reptiles and amphibians. Field identification of local species will be emphasized. Field trips required.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.

Cross Listing(s): BIOL 5445G.

BIOL 5445G Herpetology**4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Examines the phylogeny, morphology, life history and ecology of reptiles and amphibians. Field identification of local species will be emphasized. Field trips required. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor. Cross Listing(s): BIOL 5445.

BIOL 5446 Ornithology**4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

A comprehensive study of the biology of birds. Lectures will emphasize the evolution, classification, structure, physiology, behavior, and ecology of birds. Laboratories will give hands-on experience with bird morphology, and field trips will emphasize finding and identifying birds in their natural habitats.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.

Cross Listing(s): BIOL 5446G.

BIOL 5446G Ornithology**4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

A comprehensive study of the biology of birds. Lectures will emphasize the evolution, classification, structure, physiology, behavior, and ecology of birds. Laboratories will give hands-on experience with bird morphology, and field trips will emphasize finding and identifying birds in their natural habitats. Graduate students will be required to complete advanced level assignments in an area beyond the scope of the undergraduate requirements that demonstrates a higher level of mastery in the subject matter with additional required deliverables representative of graduate level work, as determined by the instructor.

Cross Listing(s): BIOL 5446.

BIOL 5448 Mammalogy**4 Credit Hours. 0,4 Lecture Hours. 0,3 Lab Hours.**

Course examines the classification, evolution, distribution and life histories of mammals. The laboratory includes identification and preparation of specimens and development of field techniques. Field trips required.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.

Cross Listing(s): BIOL 5448G.

BIOL 5448G Mammalogy**4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Course examines the classification, evolution, distribution and life histories of mammals. The laboratory includes identification and preparation of specimens and development of field techniques. Field trips required. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor. Cross Listing(s): BIOL 5448.

BIOL 5460 Phycology**4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Evolution, morphology, physiology, and ecology of the microalgal and macroalgal species found in marine and freshwater environments, with field trips to a selection of local habitats. Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.

Cross Listing(s): BIOL 5460G.**BIOL 5460G Phycology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Evolution, morphology, physiology, and ecology of the microalgal and macroalgal species found in marine and freshwater environments, with field trips to a selection of local habitats. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverable representative of graduate-level work, as determined by the instructor. Cross Listing(s): BIOL 5460.

BIOL 5470 Marine Pollution**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Covers current federal and Georgia environmental laws and regulations, coastal ecological concepts, and techniques used for remediation of environmental degradation. Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.

Cross Listing(s): BIOL 5470G.**BIOL 5470G Marion Pollution****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Covers current federal and Georgia environmental laws and regulations, coastal ecological concepts, and techniques used for remediation of environmental degradation. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverable representative of graduate-level work, as determined by the instructor. Cross Listing(s): BIOL 5470.

BIOL 5500 Bioinformatics and Biotechnology**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Utilization of databases and software for the analysis of DNA and protein information. Production of products and services using biological materials.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Cross Listing(s):** BIOL 5500G.**BIOL 5500G Bioinformatics and Biotechnology****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Utilization of databases and software for the analysis of DNA and protein information. Production of products and services using biological materials. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor. Cross Listing(s): BIOL 5500.

BIOL 5520 Epigenetics**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

The molecular mechanisms that change gene expression without changing DNA sequence will be explored. Emphasis will be placed on the effect of histone modification and DNA methylation on phenotype and genome function. The ramifications of molecular epigenetic mechanisms on ecology, evolution, and human health will be discussed. Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134. Crosslisting(s): BIOL 5520G.

BIOL 5520G Epigenetics**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

The molecular mechanisms that change gene expression without changing DNA sequence will be explored. Emphasis will be placed on the effect of histone modification and DNA methylation on phenotype and genome function. The ramifications of molecular epigenetic mechanisms on ecology, evolution, and human health will be discussed. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor. Cross Listing(s): BIOL 5520.

BIOL 5530 Wildlife Management**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

A survey of the principles and practices used to manage wildlife populations. The emphasis is on populations of importance to humans, particularly game animals. Students will explore the factors, both biotic and abiotic, that influence wildlife populations and how these factors can be managed to sustain game and nongame wildlife populations.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Cross Listing(s):** BIOL 5530G.**BIOL 5530G Wildlife Management****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

A survey of the principles and practices used to manage wildlife populations. The emphasis is on populations of importance to humans, particularly game animals. Students will explore the factors, both biotic and abiotic, that influence wildlife populations and how these factors can be managed to sustain game and nongame wildlife populations. Graduate students will be required to complete advanced level assignments in an area beyond the scope of the undergraduate requirements that demonstrates a higher level of mastery in the subject matter with additional required deliverable representative of graduate level work, as determined by the instructor. Cross Listing(s) BIOL 5530.

BIOL 5534 Conservation Biology**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Explores the causes and consequences of the loss of biodiversity, as well as methods for conserving rare species and ecosystems.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Cross Listing(s):** BIOL 5534G.**BIOL 5534G Conservation Biology****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Explores the causes and consequences of the loss of biodiversity, as well as methods for conserving rare species and ecosystems. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5534.**BIOL 5535G Sex and Evolution****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Focuses on the evolution of sex and the subsequent conflict that arises between sexes. Models for the evolution and maintenance of sexual reproduction are compared. Sex allocation theory is reviewed and special attention is drawn to genetic mechanisms that permit sex ratio of offspring to be manipulated. Sexual selection and mate choice tactics are evaluated with reference to empirical studies in behavioral ecology.

Cross Listing(s): BIOL 5535.**BIOL 5537 Biogeography****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Examines the distributional patterns of animals and plants from the perspectives of vicariance biogeography and organismal dispersal. One field trip required.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Cross Listing(s):** BIOL 5537G.

BIOL 5537G Biogeography**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Examines the distributional patterns of animals and plants from the perspectives of vicariance biogeography and organismal dispersal. One field trip required. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor. Cross Listing(s): BIOL 5537.

BIOL 5541 Tropical Marine Biology**4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

This is an intensive 2-week field course conducted at a tropical marine field station. Through daily lectures and field excursions, students are exposed to the natural history and ecology of a variety of marine organisms and ecosystems that may include mangroves, sea grasses, rocky shores and coral reefs. Additional fees required.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134 and permission of instructor.

Cross Listing(s): BIOL 5541G.

BIOL 5541G Tropical Marine Biology**4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

This is an intensive 2-week field course conducted at a tropical marine field station. Through daily lectures and field excursions, students are exposed to the natural history and ecology of a variety of marine organisms and ecosystems that may include mangroves, sea grasses, rocky shores and coral reefs. Additional fees required. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor. Cross Listing(s): BIOL 5541.

BIOL 5542 Aquatic Ecology**4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Covers the biological and physiochemical factors that affect common organisms found in local aquatic ecosystems, including streams and rivers, wetlands, estuaries, and lakes. Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134. Cross Listing(s): BIOL 5542G.

BIOL 5542G Aquatic Ecology**4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Covers the biological and physiochemical factors that affect common organisms found in local aquatic ecosystems, including streams and rivers, wetlands, estuaries, and lakes. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor. Cross Listing(s): BIOL 5542.

BIOL 5543 Biological Field Experience**4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

A field expedition involving biological investigations of a major ecosystem or natural area. Expeditions normally require 2-5 weeks in the field, depending upon the destination and the type of travel required. Additional fees required. Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134 and permission of instructor. Cross Listing(s): BIOL 5543G.

BIOL 5543G Biological Field Experience**4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

A field expedition involving biological investigations of a major ecosystem or natural area. Expeditions normally require 2-5 weeks in the field, depending upon the destination and the type of travel required. Additional fees required. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor. Cross Listing(s): BIOL 5543.

BIOL 5546 Plant Ecology**4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Examines fundamental principles and major conceptual issues in plant ecology. Students will learn about the distinctive and often unique ways in which plants interact with the biotic and abiotic components of their environment, and how these factors affect the abundance and distribution of plants.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134; and BIOL 2120 or BIOL 3535.

Cross Listing(s): BIOL 5546G.

BIOL 5546G Plant Ecology**4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Examines fundamental principles and major conceptual issues in plant ecology. Students will learn about the distinctive and often unique ways in which plants interact with the biotic and abiotic components of their environment, and how these factors affect the abundance and distribution of plants. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor. Cross Listing(s): BIOL 5546.

BIOL 5547 Marine Ecology**4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Course stresses ecological processes and adaptations that act to structure coastal associations and permit their persistence through time. The course provides a background for students interested in research in the marine sciences. Students will learn to develop good statistical designs and use various techniques to collect data in marine ecology. Several field trips are required. Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134. Cross Listing(s): BIOL 5547G.

BIOL 5547G Marine Ecology**4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Course stresses ecological processes and adaptations that act to structure coastal associations and permit their persistence through time. The course provides a background for students interested in research in the marine sciences. Students will learn to develop good statistical designs and use various techniques to collect data in marine ecology. Several field trips are required. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor. Cross Listing(s): BIOL 5547.

BIOL 5570 Stream Ecology**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Advanced study of the structural (physical and biological) and functional (energy and nutrients) characteristics of stream and river habitats. Students will explore topics including watershed, litter processing, food webs, nutrient spiraling, ecosystem metabolism, the river continuum concept, and the flood pulse concept. Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.

Cross Listing(s): BIOL 5570G.

BIOL 5570G Stream Ecology**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Advanced study of the structural (physical and biological) and functional (energy and nutrients) characteristics of stream and river habitats. Students will explore topics including watershed, litter processing, food webs, nutrient spiraling, ecosystem metabolism, the river continuum concept, and the flood pulse concept. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor. Cross Listing(s): BIOL 5570.

BIOL 5644 Insect Ecology**4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Examines the basic principles of ecology as they apply to insects. The ecology of insects will be investigated at the level of individuals, populations, communities and ecosystems. Emphasis will be placed on how insects interact with, and have evolved unique adaptations to, their abiotic and biotic environment.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Cross Listing(s):** BIOL 5644G.**BIOL 5644G Insect Ecology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Examines the basic principles of ecology as they apply to insects. The ecology of insects will be investigated at the level of individuals, populations, communities and ecosystems. Emphasis will be placed on how insects interact with, and have evolved unique adaptations to, their abiotic and biotic environment. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5644.**BIOL 5645 Behavioral Ecology Behavioral Ecology****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

This course explores how evolution and ecology shape behavior. Selected topics may include habitat use and movement patterns, trophic interactions, and inter- and intraspecific communication. Content will be covered through traditional lecture, examination of classic and modern literature, and applied problem solving or case study exercises.

Prerequisite(s): BIOL 3131 and BIOL 3133 and BIOL 3134.**Cross Listing(s):** BIOL 5645G.**BIOL 5645G Behavioral Ecology****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

This course explores how evolution and ecology shape behavior. Selected topics may include habitat use and movement patterns, trophic interactions, and inter- and intraspecific communication. Content will be covered through traditional lecture, examination of classic and modern literature, and applied problem solving or case study exercises. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor.

Cross Listing(s): BIOL 5645.**BIOL 6000 Special Topics in Biology****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

A consideration of topics and issues in biology.

BIOL 7090 Selected Topics/Biology**9 Credit Hours. 0-9 Lecture Hours. 0-9 Lab Hours.**

A course taught on a one-time basis.

BIOL 7133 Molecular Biology**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

This course provides graduate students with a fundamental knowledge of how organisms operate at the molecular level. Emphasis is on relevant biological theory and techniques in the molecular field.

BIOL 7135 Cytogenetics**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Studies from a cytological aspect of eukaryotic chromosomes including chromosome structure, chromosomal aberrations, and chromosome mapping.

BIOL 7233 Applied Biology**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Modern biological theory and technologies will be used to address applied questions related to conservation, restoration and environmental management. Emphasis will be on examining applicable, underlying theory with contemporary techniques and technologies to better understand and investigate solutions for relevant biological issues.

BIOL 7333 Evolutionary Ecology**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Evolutionary Ecology is a quantitative examination of population growth, interspecific competition, predator-prey interaction, microevolution, and game theory relevant to sexual selection and sex ratio evolution. Topics are presented via spread sheet simulations of dynamic processes. Students will analyze and simulate models and solve problems based on algebraic theoretical models.

Prerequisite(s): Graduate Status or permission of the Instructor.**BIOL 7440 Vector Ecology****4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.**

Examines physiological, evolutionary, and ecological relationships between arthropod vectors, microbial pathogens they transmit and their vertebrate hosts.

BIOL 7530 Biometry**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Provides students with basic skills in the analysis of biological data. Lectures cover both parametric and nonparametric methods, with an emphasis on the practical problems posed by biological data.

BIOL 7531 Research Methods**3 Credit Hours. 1 Lecture Hour. 4 Lab Hours.**

A general introduction to biological research methods, including computer skills, web-based resources, oral and written scientific presentations, proposal writing, and the peer-review process. This course is designed for first-year M.S. students.

BIOL 7610 Graduate Seminar**1 Credit Hour. 1 Lecture Hour. 0 Lab Hours.**

An intensive study of an advanced biological topic covered by one or more members of the graduate faculty from the department of Biology. The selected topic will vary from semester to semester. Required for M.S. degree.

BIOL 7890 Directed Individual Study**1-4 Credit Hours. 0 Lecture Hours. 0 Lab Hours.**

An independent or directed individual study supervised by a member of the graduate faculty of the Department of Biology.

BIOL 7893 Biological Problems**1-4 Credit Hours. 0 Lecture Hours. 0 Lab Hours.**

Studies of biological problems in a specialized area of biology under the supervision of a member of the biology faculty.

BIOL 7895 Research**1-3 Credit Hours. 0 Lecture Hours. 0 Lab Hours.**

Graduate students will pursue, under the direction of their advisory committee, a program of independent research in a particular area of biology. Results of the research will be presented as a thesis in partial fulfillment of the requirements for the Master of Science degree.

BIOL 7999 Thesis**1-3 Credit Hours. 0 Lecture Hours. 0 Lab Hours.**

Results of individual research will be presented as a thesis in partial fulfillment of the Master of Science degree. The thesis requires defense of design, execution, analysis and interpretation of the research project.