

# DEPARTMENT OF BIOLOGY

Natural Sciences, Mathematics, and Engineering (nsme) (<https://catalog.csub.edu/general-information/csub-information/school-natural-sciences-mathematics-engineering/>)

Department of Biology (p. 1)

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## Courses

### BIOL 1009 Perspectives in Biology (3)

Topics and issues in modern biology and their relevance to society. Two hours lecture and three hours laboratory. Not acceptable for the major or minor. Lab fee required. Satisfies general education requirement Area B2 Life Sciences.

**General Education Attribute(s):** GE (B2) Life Sciences

**Typically Offered:** Fall, Spring

**Course Fee:** Yes

### BIOL 1039 Principles of Ecology (3)

Basic ecological relationships of organisms to each other and to their physical environment. Topics include limiting factors, population dynamics, and evolutionary processes. Emphasis is placed on applications to the human condition. Two hours lectures and three hours laboratory. Not acceptable for the major or minor. Lab fee required. Satisfies general education requirement Area B2 Life Sciences.

**General Education Attribute(s):** GE (B2) Life Sciences

**Typically Offered:** Fall, Spring

**Course Fee:** Yes

### BIOL 2010 Introductory Biology - Cells (4)

Cell structure and function with emphasis on molecular aspects. Three hours lecture and three hours laboratory. Prerequisites: ENGL 1109 or equivalent and MATH 1050 (with a C or better) or CHEM 1010 or CHEM 1000. Lab fee required.

**Requisite(s):** Prerequisites: ENGL 1109 or equivalent and MATH 1050 (with a C or better) or CHEM 1010 or CHEM 1000.

**Typically Offered:** Fall, Spring

**Course Fee:** Yes

### BIOL 2110 Introductory Biology - Animals (4)

Function, form, and diversity of animals. Emphasis placed on the solutions to problems of survival and reproduction and the evolutionary relationships among various animal groups. Three hours lecture and three hours laboratory. Prerequisites: ENGL 1109 or equivalent and either MATH 1050 (or equivalent, with a C or better) or one of MATH 1209, MATH 2200, KINE 2018, PSYC 2018 or SOC 2208. Lab fee required.

**Requisite(s):** Prerequisites: ENGL 1109 or equivalent and either MATH 1050 (or equivalent, with a C or better) or one of MATH 1209, MATH 2200, KINE 2018, PSYC 2018 or SOC 2208.

**Typically Offered:** Fall, Spring

**Course Fee:** Yes

### BIOL 2120 Introductory Biology - Plants (4)

Plant structure, function, and diversity with emphasis placed on ecological and evolutionary aspects of seed plants. Three hours lecture and three hours laboratory. Prerequisites: ENGL 1109 or equivalent and either MATH 1050 (or equivalent, with a C or better) or one of MATH 1209, MATH 2200, KINE 2018, PSYC 2018 or SOC 2208. Lab fee required.

**Requisite(s):** Prerequisites: ENGL 1109 or equivalent and either MATH 1050 (or equivalent, with a C or better) or one of MATH 1209, MATH 2200, KINE 2018, PSYC 2018 or SOC 2208.

**Typically Offered:** Fall, Spring

**Course Fee:** Yes

### BIOL 2210 Human Anatomy (4)

Major structures of the human body with an emphasis on the integration of histology and gross anatomy of the skeletal, muscular, nervous, circulatory, respiratory, digestive, excretory, reproductive and endocrine systems. Not acceptable for the BS in Biology degree; acceptable for the Biology minor. Two hours lecture, three-hour laboratory, and one-hour discussion. Prerequisites: category 1 or category 2 proficiency placement in mathematics. Lab fee required.

**Requisite(s):** Prerequisites: category 1 or category 2 proficiency placement in mathematics.

**Typically Offered:** Fall, Spring

**Course Fee:** Yes

### BIOL 2220 Human Physiology (4)

Functions of major body systems with emphasis on mechanics, control, and integration. Discussion of the nervous, muscle, circulatory, respiratory, urinary, reproductive, gastrointestinal and endocrine systems. Laboratory investigations into the functions of major systems of the human body. Experiments dealing with the physiology of muscles, the circulatory and respiratory systems, metabolism and body fluids are included. Not acceptable for the BS in Biology degree; acceptable for the Biology minor. Three hours lecture and three-hour laboratory. Prerequisites: BIOL 2210 or [BIOL 2010 and either CHEM 1000 or CHEM 1003 or equivalent].

**Requisite(s):** Prerequisites: BIOL 2210 or [BIOL 2010 and either CHEM 1000 or CHEM 1003 or equivalent].

**Typically Offered:** Fall, Spring

**Course Fee:** Yes

**BIOL 2230 Microbiology (4)**

Physiochemical organization and function of microorganisms including bacteria, viruses, protozoa, helminths, and fungi. Concepts of pathogenic microbiology are emphasized in both lecture and laboratory. Not acceptable for the BS in Biology degree; acceptable for the Biology minor. Three hours lecture and three hours laboratory. Prerequisite: CHEM 1010 or CHEM 1000 or CHEM 1003 or equivalent, BIOL 2010 recommended. Lab fee required.

**Requisite(s):** Prerequisite: CHEM 1010 or CHEM 1000 or CHEM 1003 or equivalent, BIOL 2010 recommended.

**Typically Offered:** Fall, Spring

**Course Fee:** Yes

**BIOL 2240 Principles of Nutrition (2)**

Fundamentals of human nutrition based on the chemical and physiological processes of nutrient selection, digestion, absorption, and metabolism. Principles of nutrition information encountered in the public domain with discussion of weight management. Selected coverage of nutritionally influenced disease processes across the life span. The special nutritional needs of children, pregnant women, and athletes are discussed. Two hours lecture. Not acceptable for the BS in Biology degree or the Biology minor. Prerequisite: Completion of lower division GE Area B.

**Requisite(s):** Prerequisite: Completion of lower division GE Area B.

**Typically Offered:** Fall, Spring

**BIOL 2600 Current Health Problems (3)**

A study of selected factors pertaining to current public health problems, with emphasis on the physiological and sociological effects of the use of tobacco, alcohol, and drugs; developing self-awareness for health by appropriate utilization of the health system, wellness as a life-long concept through health information services; fostering physical fitness and knowledge of nutrition, especially for children and young adults; and thorough stress management. Two hours lecture. Not acceptable for the BS Biology major or Biology minor. Prerequisite: Completion of lower division GE Area B. Fulfills requirement for teaching credential.

**Requisite(s):** Prerequisite: Completion of lower division GE Area B.

**Typically Offered:** Fall, Spring

**BIOL 2901 Experiential Prior Learning (1-4)**

Evaluation and assessment of learning that has occurred as a result of prior off-campus experience relevant to the Biology curriculum. Requires complementary academic study and/or documentation. Available by petition only, on a credit, no-credit basis. Not open to post-graduate students. Although repeatable, a maximum of four units may be applied toward the major or minor, subject to advisor approval.

**Repeatable for Credit:** Yes, up to 15 units

**Typically Offered:** Fall, Spring

**BIOL 3010 General Genetics (3)**

Physical and chemical basis of inheritance in cells, individuals, and populations, including molecular mechanisms of heredity. Three hours lecture. Prerequisites: [CHEM 1000, and BIOL 2010 (with a C- or better), and 2110 or 2120] or [CHEM 1000, and BIOL 2010 (with a C- or better), 2220, and 2230].

**Requisite(s):** Prerequisite: CHEM 1000 or 211 or 150, and BIOL 2010 (with a C- or better), BIOL 2110 or 2120; or for the BA in Human Biological Sciences CHEM 1000 or 211 or 150 and BIOL 2010 (with a C- or better), 2220, and 2230.

**Typically Offered:** Fall, Spring

**BIOL 3020 General Physiology (3)**

General aspects of cellular and organismic function in animals and plants with special emphasis on physical and chemical properties that regulate physiological processes. Topics include biological solutions, membrane characteristics, fluid dynamics, gas flow, material exchange, energy acquisition and utilization, and heat exchange. Three hours lecture.

**Prerequisite:** [CHEM 1000, and BIOL 2010 (with a C- or better), BIOL 2110, and BIOL 2120] or [CHEM 1000, and BIOL 2010 (with a C- or better), BIOL 2220, and BIOL 2230].

**Requisite(s):** Prerequisite: [CHEM 1000, and BIOL 2010 (with a C- or better), 2110, and 2120] or [CHEM 1000, and BIOL 2010 (with a C- or better), 2220, and 2230].

**Typically Offered:** Fall, Spring

**BIOL 3110 General Ecology (3)**

Relationships between organisms and their environment with emphasis placed on evolutionary mechanisms and terrestrial ecosystems. Topics will illustrate ecological principles and methods. Three hours lecture.

**Prerequisite:** CHEM 1000, and BIOL 2010 (with a C- or better), BIOL 2110, and BIOL 2120.

**Requisite(s):** Prerequisite: BIOL 2010 or 201 with a C- or better, 2110 or 202, and 2120 or 203 and CHEM 1000 or 211 or 150

**Typically Offered:** Fall, Spring

**BIOL 3120 Research Design and Analysis (4)**

This class puts the scientific method into practice including a study of basic experimental design. Students develop and conduct experiments to gain experience in scientific research methods. A focus on measurements, statistical analyses, interpretation of data, and presentation and communication. Special emphasis is placed on writing in science. Two hours lecture, three hours laboratory, and one-hour discussion. Recommended for all upper-division elective courses.

**Prerequisites:** BIOL 2010 (with a C- or better), BIOL 2110 and BIOL 2120.

**Requisite(s):** Prerequisite: BIOL 2010 or 201 with C- or better and BIOL 2110 or 202 and 2120 or 203

**Typically Offered:** Fall, Spring

**BIOL 3210 Human Ecology (3)**

Ecological relationships of organisms to each other and to the environment with particular focus on the effect that humans have on the natural world. Topics include degradation of ecosystems, pollution, and global climate change. Efforts to protect these systems and conserve the biota of the world will be presented. Not acceptable for the BS in Biology degree or the Biology minor. Three hours lecture. Prerequisites: BIOL 2210, BIOL 2220, and BIOL 2230.

**Requisite(s):** Prerequisite: BIOL 2210 or 250, 2220 or 255, and 2230 or 260.

**Typically Offered:** Fall, Spring

**BIOL 3220 Human Pathophysiology (4)**

Human physiology with emphasis on the mechanisms of disease. Topics include physical responses to injury, disturbances of homeostasis in major body systems, and both physical and chemical stressors. Four hours lecture. Prerequisite: BIOL 2220.

**Requisite(s):** Prerequisite: BIOL 2220.

**Typically Offered:** Fall, Spring

**BIOL 3309 California Natural History (3)** 

Not acceptable for Biology Majors or Minors. Satisfies general education upper division Area B and Theme Q: Quality of Life. Plants, animals, ecology and biogeography of California with emphasis on fostering an appreciation of the relationships between people and California's amazing biodiversity. Three hours lecture. This course may not be used to satisfy biology major or minor requirements. Prerequisites: At least 45 units and completion of LD Area B. Satisfies general education upper division Area UDB and Theme Q: Quality of Life.

**Requisite(s):** Prerequisites: At least 45 units and completion of LD Area B.

**General Education Attribute(s):** Theme Q: Quality of Life, Upper Division B

**Typically Offered:** Spring

**BIOL 3310 Integrated Life Science (3)**

Not acceptable for Biology Majors or Minors. Open only to majors in Liberal Studies or Child, Adolescent and Family Studies. Fundamental principles of science (e.g. mechanics, thermodynamics) applied to biological systems, including ecology, evolution, and the human body. Laboratories focus on developing skills in the experimental method and processes of science with an integrated focus on biological topics. Two hours lecture and three hours laboratory. Note: this is neither a methods of teaching nor curriculum development course; the focus is on science content and process for science literacy tied to the Next Generation Science Standards. This course may not be used to satisfy biology major or minor requirements. Prerequisites: Completion of lower division liberal studies science coursework.

**Requisite(s):** Prerequisite: Open only to majors in Liberal Studies or Child, Adolescent and Family Studies.

**Typically Offered:** Fall, Spring

**BIOL 3318 Revolutionary Ideas in Human Biology (3)** 

Topics in human biology including growth and development, form and function, fitness and health, disease, interaction with the environment, and human evolution. The underlying theme will be looking at these topics through the lens of historical development revealing the revolutionary ideas and innovations that led to our current understandings. Three hours lecture. Not acceptable for Biology Majors or Minors. Prerequisites: At least 45 units and completion of LD Area B. Satisfies general education upper division Area UDB and Theme R: Revolutionary Ideas and Innovations.

**Requisite(s):** Prerequisites: At least 45 units and completion of LD Area B.

**General Education Attribute(s):** Theme R: Rev Ideas & Innovatns, Upper Division B

**BIOL 3410 General Microbiology (4)**

A comprehensive overview of the biology of microorganisms. Topics include microbial cell structure and function, physiology, metabolism, genetics, diversity, and ecology. Applied aspects of microbiology are also covered such as biotechnology, the role of microorganisms in environmental processes, food, and medical microbiology. Laboratory emphasizes methods in bacteriology, microbial diversity, and a research project. Three hours lecture and three hours laboratory. Lab fee required. Prerequisites: [CHEM 1000, and BIOL 3120] or [CHEM 1000, and BIOL 2010 (with a C- or better), BIOL 2220, and BIOL 2230 with a C- or better].

**Requisite(s):** Prerequisites: [CHEM 1000, and BIOL 3120] or [CHEM 1000, and BIOL 2010 (with a C- or better), BIOL 2220, and BIOL 2230 with a C- or better].

**Typically Offered:** Fall, Spring

**Course Fee:** Yes

**BIOL 3420 Food Microbiology (4)**

Microorganisms of importance in foods, their metabolic activities, and the kinetics involved. Source of microbial contamination during food production, processing and storage. Microbial spoilage; foods as vectors of human pathogens. Conversions of raw foods by microorganisms into food products. Microbiological standards for regulatory and trade purposes. Laboratory focuses on developing skills in detecting and quantifying microorganisms and their toxins in foods. Application of colony and direct microscopic counts, most probable numbers, enzyme immunoassays, nucleic acid probes and computer modeling are used to understand the numbers and types of microorganisms or microbial end products in foods. Three hours of lecture and three hours of laboratory. Prerequisite: BIOL 2010 and BIOL 2110.

**Requisite(s):** Prerequisite: BIOL 2010 or 201 and 2110 or 202

**BIOL 3430 Parasitology (3)**

Biology of eukaryotic parasites of humans including their transmission and control, epidemiology of parasitic diseases and zoonosis and their impact on human welfare, discussion of methods of collection, examination and identification of parasites. Three hours lecture. Prerequisite: [CHEM 1000, and BIOL 2010 (with a C- or better), BIOL 2110, or BIOL 2120] or [CHEM 1000, and BIOL 2010 (with a C- or better), BIOL 2220, and BIOL 2230].

**Requisite(s):** Prerequisite: [CHEM 1000, and BIOL 2010 (with a C- or better), BIOL 2110, or BIOL 2120] or [CHEM 1000, and BIOL 2010 (with a C- or better), BIOL 2220, and BIOL 2230].

**Typically Offered:** Fall, Spring

**Course Fee:** Yes

**BIOL 3440 Virology (3)**

Understanding the diversity and function of viruses in the environment with a focus on structure, molecular biology, replication, mutation, recombination, and evolution of viruses in addition to pathogenesis and host cell interactions. Viruses in both aquatic and terrestrial environments will be discussed. Prerequisite: [CHEM 1000, BIOL 2010 (with a C- or better), BIOL 2110, or BIOL 2120] or [CHEM 1000, and BIOL 2010 (with a C- or better), BIOL 2220, and BIOL 2230].

**Requisite(s):** Prerequisite: [CHEM 1000, BIOL 2010 (with a C- or better), BIOL 2110, or BIOL 2120] or [CHEM 1000, and BIOL 2010 (with a C- or better), BIOL 2220, and BIOL 2230].

**Typically Offered:** Fall, Spring

**BIOL 3530 Immunology (3)**

Study of the molecular and cellular interactions and principles of the immune system. Topics include immune system development, humoral & cell-mediated immunity and dysfunction. Three hours lecture. Prerequisite: [CHEM 1000, and BIOL 2010 (with a C- or better), and BIOL 2110, or BIOL 2120] or [CHEM 1000, and BIOL 2010 (with a C- or better), BIOL 2220, and BIOL 2230].

**Requisite(s):** Prerequisite: [CHEM 1000, and BIOL 2010 (with a C- or better), BIOL 2110, or BIOL 2120] or [CHEM 1000, and BIOL 2010 (with a C- or better), BIOL 2220, and BIOL 2230].

**Typically Offered:** Fall, Spring

**BIOL 3540 Hematology (3)**

Study of formed elements of blood: hematopoiesis, maturation, and cell function. Introduction to blood disorders. Three hours lecture. Prerequisite: [CHEM 1000, and BIOL 2010 (with a C- or better), BIOL 2110, or BIOL 2120] or [CHEM 1000, and BIOL 2010 (with a C- or better), BIOL 2220, and BIOL 2230].

**Requisite(s):** Prerequisite: [CHEM 1000, and BIOL 2010 (with a C- or better), BIOL 2110, or BIOL 2120] or [CHEM 1000, and BIOL 2010 (with a C- or better), BIOL 2220, and BIOL 2230].

**Typically Offered:** Fall, Spring

**BIOL 3550 Advanced Human Physiology (4)**

Human physiology with an integrative approach to organ system function. Topics include the nervous, muscle, circulatory, respiratory, digestive, renal, reproductive, and endocrine systems. Laboratory emphasis will be placed on quantitative measurement of physiological responses in the major organ systems. Three hours lecture and three hours laboratory. Lab fee required. Prerequisites: BIOL 3120 and either BIOL 2210 or BIOL 3020.

**Requisite(s):** Prerequisite: BIOL 3120 or 301 and either BIOL 2210 or 250 or 3020 or 305.

**Typically Offered:** Spring

**Course Fee:** Yes

**BIOL 3700 Special Topics in Biology (1-4)**

Topics of current interest in biology. Although repeatable, a maximum of four units may be applied toward the major or minor, subject to advisor approval.

**Repeatable for Credit:** Yes, up to 20 units

**Course Fee:** Yes

**BIOL 4100 Evolution (3)**

Study of the processes of organic evolution. Three hours lecture. Prerequisites: BIOL 3010, BIOL 3020, and BIOL 3110 or BIOL 3210.

**Requisite(s):** Prerequisites: BIOL 3010, 3020, and 3110 or 3210.

**Typically Offered:** Fall, Spring

**BIOL 4200 Medical Microbiology (4)**

Isolation and identification procedures and the clinical significance of medically important microorganisms (mainly bacteria). Key points of these organisms, epidemiology and pathogenic mechanisms will be discussed. Skills concerning the isolation and identification of medically important bacteria are emphasized in laboratory. Three hours lecture and three hours laboratory. Lab fee required. Prerequisite: BIOL 3120 and BIOL 3410 with a C- or better or BIOL 2230 with a C- or better and BIOL 3220.

**Requisite(s):** Prerequisite: BIOL 3120 and BIOL 3410 with a C- or better or BIOL 2230 with a C- or better and BIOL 3220.

**Typically Offered:** Spring

**Course Fee:** Yes

**BIOL 4310 Conservation Biology (4)**

Study of problems related to biological conservation, including endangered species issues, environmental laws, and mitigation solutions required by regulations. Includes site visits to conservation areas, collection of biological data, preparation of assessment reports, and study environmental impact reports. Three hours lecture and three hours laboratory. Prerequisites: BIOL 3110 and BIOL 3120.

**Requisite(s):** Prerequisites: BIOL 3120 and 3110.

**Typically Offered:** Spring

**BIOL 4320 Population and Community Ecology (4)**

Advanced study of ecology. Emphasis includes evolutionary perspectives of physical and biological environments, species interactions, population and community dynamics, and ecosystem stability, including theoretical foundations. Laboratory emphasis will be placed on advanced analytical and field-sampling methodologies, including field trips. Three hours lecture and three hours laboratory. Prerequisites: BIOL 3110 and BIOL 3120. Field trip fee required.

**Requisite(s):** Prerequisites: BIOL 3120 and 3110.

**Typically Offered:** Spring

**Course Fee:** Yes

**BIOL 4330 Behavioral Ecology (4)**

Animal behavior in an evolutionary and ecological context. Topics include: the comparative method, foraging and decision-making theory, anti-predator behavior, animal communication, social behaviors and systems, competition, cooperation, altruism, deceit, honesty, mating systems, parent-offspring conflict, and kin selection. Three hours lecture and three hours laboratory. Prerequisites: BIOL 3110 and BIOL 3120.

**Requisite(s):** Prerequisites: BIOL 3120 and 3110.

**BIOL 4340 Chemical Ecology (4)**

Study of ecological interactions of organisms involving chemical communication. Specifically, students will learn about chemical involvement in inter/intraspecific communication in regard to feeding, pollination, host-plant selection, microbial interactions, defense, mate finding, and social communication. Three hours lecture and three hours laboratory. Lab fee required. Prerequisite: BIOL 3110 and BIOL 3120.

**Requisite(s):** Prerequisites: BIOL 3120 and 3110.

**Course Fee:** Yes

**BIOL 4350 Environmental Microbiology (4)**

Study of microbial diversity and function. In particular, students will learn about fermentation procedures, bioremediation with the help of microbes, composting, and detection of antibiotic producing microbes, use of microbes to supply fresh drinking water, safe disposal of sewage, and how microbes are used in food, beer and wine production. Three hours lecture and three hours laboratory. Lab fee required. Prerequisites: [BIOL 3120, BIOL 3110, and BIOL 3410 with a C- or better] or [BIOL 2230 with a C- or better, BIOL 3210, and BIOL 3220].

**Requisite(s):** Prerequisites: [BIOL 3120, BIOL 3110, and BIOL 3410 with a C- or better] or [BIOL 2230 with a C- or better, BIOL 3210, and BIOL 3220].

**Course Fee:** Yes

**BIOL 4360 Aquatic Ecology (4)**

Applied and theoretical concepts of ecology in aquatic systems. Students will learn about the physical, chemical, and biological interrelationships of organisms in aquatic systems to develop an understanding of ecological processes within lakes and streams. A weekend field trip may be required. Three hours lecture and three hours laboratory. Course fee required. Prerequisites: BIOL 3120 and BIOL 3110.

**Requisite(s):** Prerequisites: BIOL 3120 and 3110.

**Course Fee:** Yes

**BIOL 4410 Entomology (4)**

Comparative study of aquatic and terrestrial insects with emphasis placed on terrestrial insect diversity. Laboratory focuses on comparative morphology, phylogeny, classification, and student projects. Three hours lecture and three hours laboratory. Lab fee required. Prerequisites: BIOL 3120.

**Requisite(s):** Prerequisite: BIOL 3120.

**Course Fee:** Yes

**BIOL 4420 Plant Diversity (4)**

Phylogeny and classification of vascular plants with emphasis on field recognition and identification of important plant families and genera characterizing the major floristic regions of California. Lectures review taxonomic diversity, evolutionary relationships, and eco-geographic patterns of western floras. Laboratory includes weekend field trips. Field trip fee required. Three hours lecture and three hours laboratory. Prerequisites: BIOL 3110 and BIOL 3120.

**Requisite(s):** Prerequisites: BIOL 3120 and 3110.

**Typically Offered:** Spring

**Course Fee:** Yes



**BIOL 4430 Wildlife Biology (4)**

Diversity, evolution, and biology of fishes, amphibians, reptiles, and mammals, with special emphasis on the identification of local species and the field techniques used to study these species. Three hours lecture and three hours laboratory. Prerequisite: BIOL 3110 and BIOL 3120.

**Requisite(s):** Prerequisites: BIOL 3120 and 3110.

**Typically Offered:** Spring

**BIOL 4440 Molecular Genetics (4)**

Concepts of molecular genetics, with an emphasis on DNA replication, transcription, and translation. Additional topics include advances in laboratory techniques in molecular biology. Three hours lecture and three hours laboratory. Lab fee required. Prerequisites: [BIOL 3010 and 3120] or [BIOL 3010 and BIOL 3220].

**Requisite(s):** Prerequisites: [BIOL 3010 and 3120] or [BIOL 3010 and 3220].

**Typically Offered:** Fall, Spring

**Course Fee:** Yes

**BIOL 4450 Genomics and Bioinformatics (4)**

Introduction to basic concepts, methods and tools used in genomics research, including the application of bioinformatics principles for genomics data analysis. Topics include biological sequence databases, nucleic acid sequencing, genome annotation, sequence alignment, domain finding, and transcriptome analysis and visualization. Three hours lecture and three hours laboratory. Prerequisites: BIOL 3010 and BIOL 3120.

**Requisite(s):** Prerequisites: BIOL 3010 and 3120.

**BIOL 4460 Evolutionary Genetics (4)**

Contributions of molecular genetics to the understanding of evolution. Emphasis is placed on the processes of mutation, selection, and random genetic events as they affect the genetic architecture of natural populations and the process of speciation. Topics include quantitative inheritance, population genetics, phylogenetics, conservation genetics, and bioinformatics. Three hours lecture and three hours laboratory. Prerequisites: BIOL 3010 and BIOL 3120.

**Requisite(s):** Prerequisites: BIOL 3010 and 3120.

**Requisite(s):** Prerequisites: BIOL 3010 and 3120.

**BIOL 4510 Comparative Vertebrate Structure (4)**

Comparative study of structure and function in vertebrate systems. Emphasis on skeletal, muscular, circulatory, respiratory, digestive, excretory, nervous, and sensory systems in an evolutionary and adaptive context. Three hours lecture and three hours laboratory. Lab fee required. Prerequisite: BIOL 3020 and BIOL 3120.

**Requisite(s):** Prerequisites: BIOL 3020 and 3120.

**Course Fee:** Yes

**BIOL 4530 Terrestrial Ecosystem Ecology (4)**

Study of organisms and the physical characteristics of the environment as an interacting and integrated system. Topics covered are the climate and geologic factors that affect ecosystems. The central processes that govern ecosystem function are covered including water, carbon, and nutrient cycles. An emphasis will be placed on how ecosystems are perturbed by environmental changes. Three hours lecture and three hours laboratory. Lab fee required. Prerequisite: BIOL 3110 and BIOL 3120.

**Requisite(s):** Prerequisites: BIOL 3110 and 3120.

**Typically Offered:** Spring

**Course Fee:** Yes

**BIOL 4540 Physiological Plant Ecology (4)**

The physiological basis of growth, reproduction, survival, abundance, and geographical distribution of plants. The ecological context of these processes will be examined by considering how plants are affected by interactions with the physical, chemical, and living components of their environment. Topics include the adaptive significance and evolutionary origins of plant functional traits. Three hours lecture and three hours laboratory. Lab fee required. Prerequisites: BIOL 3020, BIOL 3110, and BIOL 3120.

**Requisite(s):** Prerequisites: BIOL 3020, 3110, and 3120.

**Course Fee:** Yes

**BIOL 4550 Plant Structure and Function (4)**

Anatomy of plants as related to plant function. Topics include development and reproduction, the capture of light and nutrients, transport of water and solutes, storage of water and carbohydrates, and biomechanics. The evolutionary history and ecological context of these traits will also be examined as well as the use of plant structure in predicting plant function. Three hours lecture and three hours laboratory. Lab fee required. Prerequisites: BIOL 3020 and BIOL 3120.

**Requisite(s):** Prerequisites: BIOL 3020 and 3120.

**Typically Offered:** Spring

**Course Fee:** Yes

**BIOL 4560 Plant Pathology (4)**

Introduction to the main groups of pathogens that cause plant disease (bacteria, fungi, oomycetes, nematodes, viruses). Discussion of how they are spread and affect plant health, growth, and development. Additional topics include plant disease diagnosis, plant disease control, factors influencing disease development, and examples of how plant pathogens have influenced human history and culture. Three hours lecture and three hours laboratory. Lab fee required. Prerequisites: BIOL 3120 and Co/prerequisite BIOL 3410.

**Requisite(s):** Prerequisite: BIOL 3120 and pre/corequisite BIOL 3410.

**Course Fee:** Yes

**BIOL 4700 Special Topics in Biology (1-4)**

Contemporary or interdisciplinary problems of current interest. Although repeatable, a maximum of four units may be applied toward the major or minor, subject to advisor approval.

**Repeatable for Credit:** Yes, up to 20 units

**BIOL 4860 Internship in Biology (1-4)**

Internships may be arranged by the department with various agencies, businesses, or industries. The assignments and coordination of work projects with conferences and readings, as well as course credits, evaluation, and grading are the responsibility of the faculty liaison (or course instructor) working with the field supervisor. Offered on a credit, no-credit basis only. Department will determine credits and application of credit. Although repeatable, a maximum of four units may be applied toward the major or minor.

**Repeatable for Credit:** Yes, up to 20 units

**BIOL 4870 Cooperative Education (1-4)**

The Cooperative Education program offers a sponsored learning experience in a work setting, integrated with a field analysis seminar. The field experience is contracted by the Cooperative Education office on an individual basis, subject to approval by the department. The field experience, including the seminar and reading assignments, is supervised by the cooperative education coordinator and the faculty liaison (or course instructor), working with the field supervisor. Students are expected to enroll in the course for at least two semesters. The determination of course credits, evaluation, and grading are the responsibility of the departmental faculty. Offered on a credit, no-credit basis only. Department will determine application of credit. Although repeatable, a maximum of four units may be applied toward the major or minor. Not open to post-graduate students.

**Repeatable for Credit:** Yes, up to 20 units

**BIOL 4880 Research (1-4)**

Independent research: the student formulates a problem and research design in consultation with the faculty, conducts the investigation, compiles and analyzes the data, and presents the findings in written form. Offered on a credit, no-credit basis only. Although repeatable, a maximum of four units may be applied towards the major or minor. Available by invitation of instructor.

**Requisite(s):** Prerequisite: sophomore standing or higher.

**Repeatable for Credit:** Yes, up to 20 units

**BIOL 4918 Senior Seminar (1)** 

Student presentations and discussion of current topics in biology. One-hour discussion. Prerequisite: At least 90 units, completion of JYDR; Open only to senior Biology majors who have completed BIOL 3120 and at least 15 additional units of upper-division coursework specific to the major. Satisfies general education requirement Senior Capstone.

**Requisite(s):** Prerequisites: Open only to senior Biology majors who have completed JYDR, BIOL 3120 and at least 15 additional units of upper-division coursework specific to the major.

**General Education Attribute(s):** Capstone

**Typically Offered:** Fall, Spring

**BIOL 4928 Senior Seminar (2)** 

Student presentations and discussion of current topics in biology. Two-hour discussion. Prerequisite: At least 90 units, completion of JYDR; Open only to senior Human Biological Sciences major who have completed at least 15 units of upper-division coursework specific to the major. Satisfies general education requirement Senior Capstone.

**Requisite(s):** Prerequisite: At least 90 units, completion of JYDR; Open only to senior Human Biological Sciences major who have completed at least 15 units of upper-division coursework specific to the major.

**General Education Attribute(s):** Capstone

**Typically Offered:** Fall, Spring

**BIOL 4931 Experiential Prior Learning (1-4)**

Evaluation and assessment of learning which has occurred as a result of prior off-campus experience relevant to the curriculum of the department. Requires complementary academic study and/or documentation.

Available by petition only, on a credit, no-credit basis. Not open to post-graduate students. Although repeatable, a maximum of four units may be applied toward the major or minor, subject to advisor approval.

**Requisite(s):** Prerequisite: sophomore standing or higher.

**Repeatable for Credit:** Yes, up to 15 units

**BIOL 5010 Current Topics in Biology (2)**

Current topics of special interest in biology. Topics and content will vary as announced but will include contemporary or interdisciplinary areas of interest. Two hours lecture. Repeatable. Prerequisites: Graduate standing and an upper division course appropriate to the topic.

**Requisite(s):** Must have obtained graduate standing to take this class.

**Repeatable for Credit:** Yes, up to 16 units

**Typically Offered:** Fall, Spring

**BIOL 5100 Advanced Experimental Design and Analysis (4)**

Course covers how to effectively communicate biological science to the scientific community, effective methodology in experimental design, proposal writing, including writing specific aims and creating a budget. Note, writing is an important component of this course and students are expected to be prepared for Master's level writing course content and requirements. Two hours lecture, one-hour discussion, and three hours laboratory. Prerequisites: Graduate standing.

**Requisite(s):** Prerequisite: Graduate standing.

**Typically Offered:** Spring

**BIOL 5710 Advanced Topics in Biology (4)**

Laboratory or field based graduate level biological topics in a specialized area of contemporary biology. Three hours lecture and three hours laboratory. Prerequisites: Graduate standing or consent of instructor and an upper division course appropriate to the topic. May be repeated for credit with different topics up to a maximum of 20 units.

**Requisite(s):** Prerequisite: Graduate standing.

**Repeatable for Credit:** Yes, up to 20 units

**BIOL 5901 Research (1-3)**

Independent research: the student formulates a problem and research design in consultation with the faculty, conducts the investigation, compiles and analyzes the data, and presents the findings in written form. Repeatable. Although repeatable, a maximum of 5 units may be applied towards the Master's degree. Prerequisites: Graduate standing and consent of the advisor.

**Requisite(s):** Prerequisite: Graduate standing.

**Repeatable for Credit:** Yes, up to 5 units

**BIOL 5911 Graduate Practicum in the Teaching of Biology (2)**

Theory and practice in teaching biology at the undergraduate level. Regular meetings with the faculty sponsor and supervised experience in course design, lecturing, tutoring, laboratory preparation and delivery, administering and scoring examinations, and leading classroom discussions. Scored on a credit/no credit basis only. One-hour lecture and three hours laboratory. Prerequisites: Graduate standing and advisor consent.

**Requisite(s):** Prerequisite: Graduate standing.

**Typically Offered:** Fall, Spring

**BIOL 6010 Seminar in Biology (2)**

Seminar in ecology and/or evolutionary biology. Includes student presentations, discussion, and a scientific writing assignment. Course also includes discussion of Responsible Conduct of Research. Two hours discussion. Repeatable. Prerequisites: Approved petition for advancement to candidacy.

**Requisite(s):** Prerequisite: Advancement to candidacy.

**Typically Offered:** Spring

**BIOL 6901 Non-Thesis Examination (1)**

Comprehensive examination of graduate-level breadth administered by the Departmental Graduate Committee. Scored on a credit/no-credit basis only. Prerequisites: Approved petition for advancement to candidacy.

**Requisite(s):** Must have obtained graduate standing to take this course.

**Typically Offered:** Spring

**BIOL 6911 Thesis (1-3)**

Laboratory, field investigation, or a combination of both investigating a research problem. Although repeatable, a maximum of 5 units may be applied towards the degree. Prerequisites: Approved petition for advancement to candidacy.

**Requisite(s):** Must have obtained graduate standing to take this course.

**Repeatable for Credit:** Yes, up to 5 units

**Typically Offered:** Fall, Spring

**BIOL 6921 Thesis Defense (1)**

Preparation, completion (including final submission to the library), and oral defense of a written thesis approved by the Thesis Committee and the Departmental Graduate Committee. Scored on a credit/no-credit basis. Prerequisites: Approved petition for advancement to candidacy.

**Requisite(s):** Must have obtained graduate standing to take this course.

**BIOL 7000 Continuous Enrollment (0)**

Graduate students who have completed the majority of their coursework but have not completed their culminating experience or thesis may enroll in this 0-unit course for the purpose of maintaining continuous enrollment. Prerequisite: approval of the Program Coordinator.

**Repeatable for Credit:** Yes, up to 0 units

**Typically Offered:** To Be Determined

## Faculty

**Faculty:** D. Dodenhoff, A. Doty, M. Engel, I. Francis, J. Gillard, L. Hall, A. Jacobsen, K. Keller, C. Kloock, A. Lauer, R. McNeish, J. Mead Vaughn, R.B. Pratt, C. Robles, P. Smith, R. Stark, A. Stokes, K. Szick, M. Thomey

**Public Health Faculty:** Linh Bui, Andrea Lopez, Chia Thao