

## BIOLOGY

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The Department of Biology offers the Bachelor of Science and the Master of Science in Biology. Throughout its curriculum the Department emphasizes evolution and the relationship between organisms and the environment. Classes include extensive field and laboratory investigations allowing students to observe and measure biological systems. Students are encouraged to select elective courses best suited to their interests. See Biology Tracks below.

### Requirements for the Major

The Bachelor of Science in Biology curriculum includes a wide range of courses that allow for diverse student interests. The courses required for this degree are listed below.

Students seeking a Bachelor of Science in Biology must complete the following:\*

#### 1. Biology courses

- a. BIOL 201, 202, and 203
- b. BIOL 310, 304, 305, 306, 470 and 490
- c. At least 25 units of additional upper division elective coursework in Biology. At least three courses must be five units with lab and at least one must be at the 400-level.

\*A minimum GPA for these 65 units is 2.0

#### 2. Cognates<sup>+</sup>

- a. CHEM 212 or equivalent. (Note: CHEM 211 is a prerequisite to CHEM 212 and may be counted toward a Chemistry minor.)
- b. MATH 191 or equivalent
- c. MATH 140 or MATH 211
- c. At least 10 units in appropriate cognate areas subject to the approval of the advisor.

<sup>+</sup> A minimum GPA for these 25 units is 2.0

### Biology Tracks

Students obtaining the BS in Biology are encouraged to take course sequences (tracks) with specific emphases such as Ecology/Field Biology, Physiology, Zoology, Pre-professional Biology, Clinical Laboratory Sciences, and Physical Therapy. These unofficial tracks are not listed on the diploma or transcript. For example, a track in Pre-professional Biology would include two years of chemistry, one year of physics, math through calculus, and selected electives in Biology. Specific courses recommended for these tracks can be obtained from an advisor or the Biology Department office.

### Requirements for the Minor

A minor in Biology consists of four courses (18-20 units), two of which must be upper division. Only courses applicable to the major will be accepted for the minor. Requests for approval are to be submitted to the Department Chair. A minimum grade point average of 2.0 is required for the units applied towards the Minor.

### **Science Teacher Preparation Program Leading to a Degree in Natural Sciences, Primary Concentration in Biology**

CSUB has developed a degree program, the Bachelor of Arts in Natural Sciences, to prepare prospective science teachers for subject matter certification in California via the California Subject Matter Examinations for Teachers (CSET) in Science. See the catalog section under Natural Sciences for information about this degree program. Additional information may be obtained from the Biology Department office (661- 654-3089).

### **COURSE DESCRIPTIONS**

#### ***Lower Division***

#### **BIOL 100 Perspectives in Biology (5)**

Topics and issues in modern biology and their relevance to society. Four hours lecture and three hours laboratory. Lab fee required.

#### **BIOL 103 Principles of Ecology (5)**

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. Four hours lectures and three-hour laboratory. Lab fee required.

**Note:** Students are encouraged to take a 100-level science course before the 200 series if they lack a firm background in high school or college science courses.

#### **BIOL 201 Introductory Biology - Cells (5)**

Cell structure and function with emphasis on molecular aspects. Two hours lecture and nine hours laboratory. Prerequisites: ENGL 110 and CHEM 150 or equivalent. Lab fee required.

#### **BIOL 202 Introductory Biology - Animals (5)**

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. Two hours lecture and nine hours laboratory. Prerequisite: BIOL 201. Lab fee required.

#### **BIOL 203 Introductory Biology - Plants (5)**

Plant structure, function, and diversity with emphasis placed on ecological and evolutionary aspects of seed plants. Two hours lecture and nine hours laboratory. Prerequisite: BIOL 201. Lab fee required.

#### **SCI 213 Introduction to Biology (4)**

Introduction to basic biological principles from the cellular to the ecosystem level. Topics include: properties of living systems; structure and function of cells, organs and organ systems; DNA; inheritance; reproduction; ecosystems. Three hours lecture and three hours laboratory. Prerequisites: SCI 111 and SCI 112 or CHEM 150. Open only to majors in Liberal Studies or Child, Adolescent and Family Studies.

#### **BIOL 220 Current Health Problems (3) (formerly BIOL 320)**

A study of select 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. Three hours lecture. Prerequisite: Completion of General Education Area B. Fulfills requirement for teaching credential.

**BIOL 250 Human Anatomy (5)**

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. Three hours lecture and six hours laboratory. Lab fee required.

**BIOL 255 Human Physiology (5)**

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. Five hours lecture. Prerequisites: BIOL 250 or 201 and CHEM 150 or equivalent.

**BIOL 256 Laboratory in Human Physiology (1)**

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. Three hours laboratory. Lab fee required. Corequisite: BIOL 255.

**BIOL 260 Microbiology (5)**

Physiochemical organization and function of microorganisms including bacteria, viruses, protozoa, helminths, and fungi. Concepts of pathogenic microbiology are emphasized in both lecture and laboratory. Three hours lecture and six hours laboratory. Lab fee required. Prerequisite: CHEM 150 or equivalent.

**BIOL 270 Principles of Nutrition (3)** (formerly BIOL 370)

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 emphasis on 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. Three hours lecture. Not acceptable for the major or minor. Prerequisite: Satisfaction of General Education Area B.

**BIOL 289 Experiential Prior Learning (variable units)**

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. Interested students should contact the Biology Department office.

***Upper Division***

**BIOL 304 General Genetics (4)**

Physical and chemical basis of inheritance in cells, individuals, and populations, including molecular mechanisms of heredity. Three hours lecture and three hours laboratory. Prerequisites: BIOL 201 and 202 or 203; CHEM 211.

**BIOL 305 General Physiology (4)**

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 and three hours laboratory. Prerequisite: BIOL 201, 202 and 203; CHEM 211.

**BIOL 306 General Ecology (4)**

Relationships between organisms and their environment with emphasis placed on evolutionary mechanisms and terrestrial ecosystems. Laboratory work illustrating ecological principles and methods. Three hours lecture and three hours laboratory. Prerequisite: BIOL 201, 202 and 203; CHEM 211.

**BIOL 310 Research Design and Analysis. (5)**

Construction of basic experimental designs based upon literature and data analyses. Students develop and participate in experimental designs of selected research projects including measurements, statistical analyses, and interpretation of data. Special emphasis placed upon the written presentation of the investigation. Two hours lecture and nine hours laboratory. Recommended for all upper division elective courses. Prerequisites: BIOL 201, 202 and 203. Recommended: MATH 140 or 191 or 211.

**BIOL 312 General Microbiology (5)**

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. Two hours lecture and nine hours laboratory. Lab fee required. Prerequisites: BIOL 201 and CHEM 211.

**BIOL 314 Medical Microbiology (5) (formerly BIOL 414)**

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 is emphasized in laboratory. Two hours lecture and nine hours laboratory. Lab fee required. Prerequisite: BIOL 260 or 312.

**BIOL 316 Parasitology (4)**

Biology of animal parasites of humans including their transmission and control; epidemiology of parasitic diseases and zoonosis and their impact on human welfare; laboratory methods of collection, examination, preparation, and identification of parasites. Three lectures and one three-hour laboratory. Prerequisite: Biology 201 and 202.

**BIOL 317 Medical Mycology (3)**

Elementary principles of mycology. Isolation and identification techniques of the more common medically important human fungal parasites. Two hours lecture and three hours laboratory. Lab fee required. Prerequisite: BIOL 201.

**BIOL 318 Immunology (4)**

Study of organs, cells, and molecules responsible for the recognition and disposal of foreign materials that enter the body. Practical considerations and applications. Four hours lecture. Prerequisite: BIOL 201; BIOL 319 recommended.

**BIOL 319 Hematology (4)**

Study of formed elements of blood: hematopoiesis, maturation, and cell function. Introduction to blood dyscrasias. Four hours lecture Prerequisite: BIOL 201.

**BIOL 321 Plant Diversity (5)**

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 for which a fee is required. Two hours lecture and nine hours laboratory. Prerequisite: BIOL 203.

**BIOL 322 Vertebrate Diversity (5)**

Diversity, evolution, and biology of fish, amphibians, reptiles, and mammals, with special emphasis on the biology and identification of local species. Two hours lecture and nine hours laboratory. Prerequisite: BIOL 202.

**BIOL 323 Studies in Animal Rehabilitation (5)**

Study and practicum of the repair, care, and release of injured animals; studies of the life histories, ecology, and biology of birds, particularly raptors. Two hours lecture and nine hours laboratory. Prerequisite: BIOL 202 or consent of instructor.

**BIOL 323L Practicum in Animal Rehabilitation (2)**

Practicum in the repair, care and release of injured animals; present conservation programs to schools and groups. Six hours laboratory. Can be repeated. Not applicable to the major or minor. Credit/No Credit. Prerequisite: BIOL 323 or consent of instructor.

**BIOL 324 Insect Biology and Diversity (5)**

Comparative study of aquatic and terrestrial insects with emphasis placed on terrestrial insect diversity. Laboratory focuses on comparative morphology, phylogeny, classification, and student projects. Lab fee required. Two hours lecture and nine hours laboratory. Prerequisite: BIOL 202.

**SCI 325A Integrated Life Science (4)**

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 six hours laboratory. Prerequisites: SCI 213 or BIOL 100, and SCI 214. Note: this is neither a methods of teaching nor curriculum development course; the focus is on science content and process for science literacy. Open only to majors in Liberal Studies or Child, Adolescent and Family Studies.

**BIOL 342 Cell Physiology (5)**

Discussions of current topics in cellular physiology with emphasis placed on bioenergetics, enzyme kinetics and regulation of cellular activity. Two hours lecture and nine hours laboratory. Prerequisite: BIOL 201.

**BIOL 351 Comparative Vertebrate Anatomy (5)**

Classical anatomy and the analysis of form in terms of the phylogenetic history of the major vertebrate groups: fishes, amphibians, turtles, lizards and snakes, birds and mammals. A survey of the vertebrate groups is followed by the study of the skeletal, muscular, digestive, respiratory, circulatory, urogenital, nervous and sensory systems. Two hours lecture and nine hours laboratory. Lab fee required. Prerequisite: BIOL 202.

**BIOL 355 Human Pathophysiology (5)**

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. Five hours lecture. Prerequisite: BIOL 255 or 357.

**BIOL 357 Human Physiology (5)**

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. Two hours lecture and nine hours laboratory. Lab fee required. Prerequisite: BIOL 201 and either 250 or 305.

#### **SCI 370A Human Biology (5)**

Current topics in human biology, which include growth and development, form and function, fitness and health, interaction with the environment, and evolution. Five hours lecture. Prerequisites: Successful completion of General Education Areas A and B. Satisfies general education upper division Theme I requirement.

#### **SCI 370C Insects and People. (5)**

Overview of the global impact of insects on human concerns, including the overwhelming abundance and diversity of insects, the role of insects as disease vectors to humans, livestock and pets, and the impact of insects as agricultural pests, and pollinators. Five hours lecture. Prerequisite: Successful completion of General Education Areas A and B. Satisfies general education upper division Theme I requirement.

#### **SCI 370D Biology of Sex (5)**

Why do humans have sex in private and for fun rather than procreation? Human sexual practices are unusual when compared with animals, plants and microorganisms in that humans have menopause, concealed ovulation, and monogamy. In this course human sexuality is compared against the broad spectrum of sex in all organisms. Five hours lecture. Prerequisites: Successful completion of General Education Areas A and B. Satisfies general education upper division Theme I requirement.

#### **SCI 370E Microbiology and the Human Condition (5)**

Introduces the non-science student to the wonders of the incredible diversity in the unseen microbial world that flourishes in and around us. Emphasizes the relevance of microbes and their role in everyday lives, especially their roles in communicable and sexually transmitted diseases, food borne illnesses and bioterrorism. Five hours lecture. Prerequisite: Successful completion of General Education Areas A and B. Satisfies general education upper division Theme 1 requirement.

#### **SCI 380A California Natural History (5)**

Plants, animals, ecology and biogeography of California with emphasis on fostering an appreciation of the relationships between people and California's amazing biodiversity. Five hours lecture. Prerequisites: Successful completion of General Education Areas A and B. Satisfies general education upper division Theme I requirement.

#### **BIOL 377 Special Topics in Biology (1-5)**

Topics of current interest in biology. Although repeatable, a maximum of five units may be applied toward the major or minor. Not necessarily restricted to Biology majors. A field trip fee may be required when applicable; consult the class schedule for specific costs. (**Note:** Field trips are for Biology majors only.)

#### **BIOL 404 Conservation Biology (5)**

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. Two hours lecture and nine hours laboratory. Prerequisites: BIOL 306 and 310.

**BIOL 406 Advanced Ecology (5)**

Advanced study of ecology. Emphasis includes evolutionary perspectives of physical and biological environments, population dynamics, and ecosystem stability. Laboratory emphasis will be placed on analytical methods used in the field. Laboratory includes weekend field trips. Two hours lecture and nine hours laboratory. Field trip fee required. Prerequisites: BIOL 306 and 310.

**BIOL 424 Evolutionary Genetics (5)**

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. Two hours lecture and nine hours laboratory. Prerequisites: BIOL 304 and 310.

**BIOL 430 Molecular Biology (5)**

Evolution and molecular organization of the cell, macromolecules of organisms, and gene expression. Emphasis placed on recombinant DNA techniques, genetic engineering and biotechnology. Two hours lecture and nine hours laboratory. Lab fee required. Prerequisite: BIOL 304 and 310.

**BIOL 433 Developmental Biology (5)**

Development and growth of organisms from fertilization to the establishment of organ systems. Two hours lecture and nine hours laboratory. Lab fee required. Prerequisites: BIOL 304 and 310.

**BIOL 440 Honors Practicum in the Teaching of Biology (3)**

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. Two hours lecture and three hours laboratory. Offered on a credit, no-credit basis only. Prerequisites: Open to biology majors by faculty invitation only, Senior status and a GPA above 3.2.

**BIOL 451 Functional Analysis of Vertebrate Structure (5)**

Anatomy of vertebrates interpreted in terms of function including support, running, jumping, digging, climbing, swimming, flying and feeding. These functions are studied in their environmental context and as evolutionary adaptations. Independent student project will focus on one of these adaptations. Two hours lecture and nine hours laboratory. Lab fee required. Prerequisite: BIOL 351.

**BIOL 455 Physiological Measurements (5)**

Physiological measurement techniques focusing on data collection and analysis of selected vertebrate organ systems. Discussion topics include electrical properties of nerve, cardiac and skeletal muscle tissues, pulmonary and metabolic function, and sensory physiology. Emphasis will be placed on understanding the mechanisms of how each system works and the benefits and limitations of the measurement techniques currently available. Two hours lecture and nine hours laboratory. Lab fee required. Prerequisites: BIOL 255 or 357, BIOL 305 and BIOL 310.

**BIOL 462 Plant Physiology (5)**

Structure, function, and physiological mechanisms of vascular plants. Topics include water and nutrient relations, photosynthesis and respiration. Two hours lecture and nine hours laboratory. Prerequisites: BIOL 305 and 310.

**BIOL 470 Evolution (5)**

Study of the processes of organic evolution. Four hours lecture and three hours laboratory. Prerequisites: Open only to senior Biology majors who have completed BIOL 304, 305, 306 and 310.

**BIOL 477 Special Topics in Biology (1-5)**

Contemporary or interdisciplinary problems of current interest. Typical topical areas might include pollution, population or integrative biological phenomena. Although repeatable for different topics, a maximum of five units may be applied toward the major or minor. Not necessarily restricted to Biology majors.

**BIOL 480 Research (1-5)**

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 five units may be applied towards the major or minor. Available by consent of instructor.

**BIOL 489 Experiential Prior Learning (variable units)**

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. Although repeatable, a maximum of five units may be applied toward the major or minor. Not open to post-baccalaureate students. Interested students should contact the department office.

**BIOL 490 Senior Seminar (3)**

Student original research presentations and discussion of current topics in biology. Three hours discussion. Prerequisites: Open only to senior Biology majors who have completed Biology 310 and 40 units of Biology courses.

**BIOL 496 Internship in Biology (1-5)**

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 five units may be applied toward the major or minor.

**BIOL 497 Cooperative Education (variable units)**

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 quarters. 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.

**GRADUATE COURSES**

Graduate courses are listed in the "Graduate Programs" section of this catalog.