

Associate in Science Degree

Field Ecology, Certificate of Achievement

Division of Science and Allied Health

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Biology

Associate in Science Degree

Program Information

Biologists work as laboratory technologists, x-ray and respiratory technologists, physical therapists, physicians, nurses and researchers in the medical field; as foresters, wildlife and fisheries biologists, field ecologists, ethnobiologists, botanists, entomologists, and others in field biology and ecology; as veterinary technicians, researchers and doctors in veterinary medicine; as agronomists, plant pathologists, enologists and pest management specialists in agriculture; as educators in K-12 schools, community colleges and universities; and in many other careers.

Career Opportunities

The major is designed to meet some of the common lower-division requirements for a major in Biology.

Note: Students planning to transfer to four-year institutions are advised to meet with a counselor for general education requirements.

Upon completion of this program, the student will be able to:

- use the scientific method to pose questions and test hypotheses about the natural world.
- evaluate the design, analysis, and interpretation of scientific experiments.
- demonstrate an understanding of the process of biological evolution by the mechanism of natural selection.
- use and understand biological laboratory techniques and safety protocols.
- recognize and define a core set of biological terms and principles.
- compile and analyze data generated through experimentation.

Required Program

	Units
CHEM 400 General Chemistry (5).....	5
or CHEM 305 Introduction to Chemistry (5)	

A minimum of 10 units from the following: 10

- BIOL 402 Cell and Molecular Biology (5)
- BIOL 412 Plant Biology (5)
- BIOL 422 Animal Biology (5)
- BIOL 440 General Microbiology (4)

- BIOL 430 Anatomy and Physiology (5)
- BIOL 431 Anatomy and Physiology (5)

A minimum of 8 units from the following:..... 8

These eight (8) units may be obtained by completion of any biology courses offered at Sacramento City College, including the ones not taken from the list above, or equivalent courses from other colleges or universities.

Total Units Required **23**

Associate in Science (A.S.) Degree

The Associate in Science Degree may be obtained by completion of the required program, plus general education requirements, plus sufficient electives to meet a 60-unit total. See SCC graduation requirements.

Field Ecology

Certificate of Achievement

Program Information

The Field Ecology Certificate program provides the student with the training and education necessary to succeed in governmental agency and private businesses/non-profits that provide field ecology services. The students will have the opportunity to learn ecological field methods including identification of flora and fauna, quantitative assessment methods, wetland delineations, regulatory processes, restoration ecology, and geographic information systems. In addition to field methods, students will receive education in general ecological principles.

Career Opportunities

The Field Ecology Certificate can fulfill the needs of agencies and private businesses/non-profits for entry-level ecological/environmental technicians and field biologists. Entry-level jobs can be found in governmental resource agencies at the federal, state, and local levels and in private environmental consulting businesses and private non-profit environmental organizations. This certificate program will provide advancement opportunities to those currently employed in the environmental and resource professions. In addition to updating of job skills, this certificate will provide new training and education opportunities for returning and continuing students.

Upon completion of this program, the student will be able to:

- demonstrate the basic principles of ecology particularly in the context of field oriented biology.
- identify flora and fauna of the region.
- assess ecosystem evaluation methods and demonstrate competence in ecosystem analysis methodologies.
- examine the regulatory processes and agencies involved with environmental regulations at the local, state, and federal levels.
- understand the evolutionary process and its role in ecosystems.

Biology (BIOL)

BIOL 100 Introduction to Concepts of Human Anatomy and Physiology 3 Units

Prerequisite: None.
Advisory: AH 110, ENGRD 110, or ESLR 320, and ENGWR 50 or ESLW 310 with grades of "C" or better.
General Education: AA/AS Area IV
Hours: 54 hours LEC

This is a lecture course required for students entering the licensed vocational nursing and occupational therapy assistant programs. It is designed for students having little or no background in the biological sciences. The course is also open to any students wishing to fulfill their Natural Science general education requirement for the AA/AS degree, or AA/AS degree general education requirement, or those intending to pursue studies in the biological sciences who need to strengthen or develop a vocabulary in human anatomy and physiology.

BIOL 290 Science Skills and Applications .5 Unit

Prerequisite: None.
Corequisite: Current enrollment in a science course.
Hours: 27 hours LAB

This course offers individualized instructional modules designed to acquire or improve reading skills in the various science classes. A partial list of skills may include the following: textbook comprehension, principle of learning and retention, note taking, annotating, discipline-based vocabulary, paraphrasing, reading graphics, test taking, and problem solving. Registration is open through the ninth week of the semester. To begin the course any later than that week would not permit completion of course material. This course may be taken four times for credit and is graded Pass/No Pass.

BIOL 295 Independent Studies in Biology 1-3 Units

Prerequisite: None
Hours: 54 hours LEC
 See Independent Studies

BIOL 299 Experimental Offering in Biology .5-4 Units

Prerequisite: None
Hours: 72 hours LEC; 27 hours LAB
 See Experimental Offerings

Required Program	Units
BIOL 305 Natural History.....	4
BIOL 320 Field Botany.....	3
BIOL 360 Environmental Regulations.....	3
BIOL 362 Field Methods in Ecology.....	3
Subtotal Units	13

Pathway 1

BIOL 412 Plant Biology (5).....	5
or BIOL 422 Animal Biology (5)	
A minimum of 5 units from the following:	5
BIOL 323 Ethnobotany (4)	
BIOL 330 Natural History of Insects (3)	
BIOL 332 Introduction to Ornithology (2)	
BIOL 350 Environmental Biology (3)	
BIOL 364 Restoration Ecology (2)	
BIOL 370 Introduction to Marine Environment (4)	
BIOL 390 Natural History Field Study (0.5 - 4)	
BIOL 494 Topics in Biology (0.5 - 4)	
GEOG 330 Introduction to Geographic Information Systems (3)	
GEOG 332 Introduction to Desktop GIS (2)	
GEOG 333 Intermediate Desktop GIS (2)	
GEOL 345 Geology of California (3)	
CHEM 320 Environmental Chemistry (4)	
BIOL 352 Conservation Biology at ARC (4)	
Pathway 1 Units:.....	10
Total Units Required	23

Pathway 2

A minimum of 10 units from the following:	10
BIOL 323 Ethnobotany (4)	
BIOL 330 Natural History of Insects (3)	
BIOL 332 Introduction to Ornithology (2)	
BIOL 350 Environmental Biology (3)	
BIOL 364 Restoration Ecology (2)	
BIOL 370 Introduction to Marine Environment (4)	
BIOL 390 Natural History Field Study (0.5 - 4)	
BIOL 494 Topics in Biology (0.5 - 4)	
GEOG 330 Introduction to Geographic Information Systems (3)	
GEOG 332 Introduction to Desktop GIS (2)	
GEOG 333 Intermediate Desktop GIS (2)	
GEOL 345 Geology of California (3)	
CHEM 320 Environmental Chemistry (4)	
BIOL 352 Conservation Biology at ARC (4)	
Pathway 2 Units:	10
Total Units Required	23

Certificate of Achievement

The Certificate of Achievement may be obtained by completion of the required program with grades of "C" or better.

BIOL 305 Natural History 4 Units

Prerequisite: None.

General Education: AA/AS Area IV; CSU Area B2; CSU Area B3; IGETC Area 5B

Course Transferable to UC/CSU

Hours: 54 hours LEC; 54 hours LAB

The course is a survey of ecosystems in California with a special emphasis on the relationships between the species and general ecological concepts. Students will explore the environment and diversity of organisms occurring in our geographical area but will be able to apply this knowledge to other areas as well. Attendance on a minimum of one or two field trips is required. The course is designed for the non-science major.

BIOL 308 Contemporary Biology 3 Units

Prerequisite: None.

General Education: AA/AS Area IV; CSU Area B2; IGETC Area 5B

Course Transferable to UC/CSU

Hours: 54 hours LEC

This course is a survey of biological science intended to equip the student to think and act intelligently with respect to contemporary issues in biology. Biological topics are introduced in a framework of natural selection. The course is for those not intending to major in biological sciences, particularly liberal studies majors. Genetics is a significant focus of the course, as are origin of cellular life, cellular physiology, and diversity of organisms. A laboratory illustrating the principles introduced is offered as an optional accompanying course.

BIOL 309 Contemporary Biology Laboratory 1 Unit

Prerequisite: None.

Corequisite: BIOL 308

General Education: CSU Area B3; IGETC Area 5B

Course Transferable to UC/CSU

Hours: 54 hours LAB

This course is an optional laboratory accompaniment to BIOL 308. The sessions will illustrate biological phenomena and their relationship to contemporary concerns and discoveries in biology.

BIOL 320 Field Botany 3 Units

Prerequisite: None.

General Education: AA/AS Area IV

Course Transferable to CSU

Hours: 36 hours LEC; 54 hours LAB

This course is designed for both science and nonscience students to learn about plant taxonomy. Students will learn about the classification of flowering plants, how to identify plant species, and will become familiar with native plants of California as well as their ecological relationships and historical uses. A plant collection and a minimum of 10 field trips are required.

BIOL 323 Ethnobotany 4 Units

Prerequisite: None.

General Education: AA/AS Area IV; AA/AS Area VI; CSU Area B2; CSU Area B3; IGETC Area 5B

Course Transferable to UC/CSU

Hours: 54 hours LEC; 54 hours LAB

This introductory course focuses on the concepts, questions, and methods of ethnobotany (the scientific study of the interactions between plants and humans). Students will use the scientific method to investigate the ecological and biological traits of plants, how these traits have shaped multicultural human use, and have also been affected by humans. Topics include plant structure and reproduction, biodiversity and plant evolution in natural and cultivated systems, traditional ecological knowledge and management techniques, ethnobotanical research methods and ethical issues, and a comparison of plant use by various cultures for food, medicine, shelter, basketry, and dyes. Laboratory topics include plant identification, experimental investigation of medicinal and food value of selected plants, traditional preparation of selected plants, preparation of herbarium specimens, and analysis of plant fibers and dyes. One field trip is required.

BIOL 330 Natural History of Insects 3 Units

Prerequisite: None.

General Education: AA/AS Area IV

Course Transferable to UC/CSU

Hours: 54 hours LEC

This course provides an introduction to the science of Entomology. Approximately eighty percent (80%) of all known species of animals are insects; therefore, they often have a profound effect on human civilization. Insects are extremely successful animals, and despite their small size, they affect many aspects of human lives. All varieties of natural and modified ecosystems, both terrestrial and aquatic, support communities of insects that present a variety of lifestyles, forms, and functions. Through the study of insects, students can observe the major principles of numerous fields of study including ecology, ethology (behavioral ecology), population, and community ecology, among others, right in their own backyards. Due to their diversity and presence in all kinds of environments, insects provide a good framework for making scientific observations. Attendance on one field trip is required.

BIOL 332 Introduction to Ornithology 2 Units

Prerequisite: None.

General Education: AA/AS Area IV (effective Summer 2009)

Course Transferable to CSU

Hours: 18 hours LEC; 54 hours LAB

This introductory course covers the biology and natural history of birds. Topics include the evolutionary origins of birds and flight, avian physiology and sensory systems, migration, social behavior, reproduction, and conservation. Laboratory work explores bird structure and function, and teaches the taxonomic classification and identification of birds, particularly those found in California and the western United States. Four to six field trips (which may include one overnight trip) are required in which students study bird identification, behavior, and ecology.

BIOL 342 The New Plagues: New and Ancient Infectious Diseases Threatening World Health 3 Units

Prerequisite: None.

General Education: AA/AS Area IV; CSU Area B2; CSU Area E1; IGETC Area 5B

Course Transferable to UC/CSU

Hours: 54 hours LEC

This course will explore the biology, epidemiology, and pathology of selected pathogenic prions, viruses, bacteria, protozoa, and helminths threatening public health worldwide. The course will also explore how human behavior and human activities have catalyzed the emergence of new infectious diseases and re-emergence of ancient plagues.

BIOL 350 Environmental Biology 3 Units

Prerequisite: None.

General Education: AA/AS Area IV; CSU Area B2; IGETC Area 5B

Course Transferable to UC/CSU

Hours: 54 hours LEC

This course is a discussion of basic ecological processes as a basis for understanding environmental problems and formulating strategies for their solution. Basic biological and ecological principles are discussed in relation to environmental disruptions. Human interactions with the environment and their meaning for animals and plants are examined. One field trip is required for this course.

BIOL 360 Environmental Regulations 3 Units

Prerequisite: None.

Advisory: BIOL 305 and ENGWR 100 with grades of "C" or better.

Course Transferable to CSU

Hours: 54 hours LEC

This course examines the environmental regulatory process in California. Federal and California environmental laws will be studied and discussed. Relevant laws include: The National Environmental Policy Act, Federal Endangered Species Act, Marine Mammal Protection Act, Clean Water Act, California Environmental Quality Act, California Endangered Species Act, California Fish and Game Code, California Coastal Act. In addition, the jurisdictional wetland delineation process will be studied in detail including field work to demonstrate the process. Students will be introduced to these regulations during lectures and will participate in discussions and examinations of case studies involving these laws. One field trip is required.

BIOL 362 Field Methods in Ecology 3 Units

Prerequisite: BIOL 305 and BIOL 320 or equivalent college-level courses with a grade of "C" or better.

Advisory: ENGWR 100 with a grade of "C" or better.

Course Transferable to CSU

Hours: 36 hours LEC; 54 hours LAB

This course is an introduction to methods for sampling and studying of a variety of organisms in the field with a particular emphasis on the vegetation, fish, and wildlife of the area. The goals are to gain experience and develop skills in the following areas: identification of plants and animals, first-hand knowledge of a wide array of organism life histories, quantitative field research techniques and procedures applicable to plants and animals, and recording of data and observations in a field notebook. Required field trips (approximately 10) are to local habitats and focus on seasonally relevant events and processes.

BIOL 364 Restoration Ecology 2 Units

Prerequisite: None.

Course Transferable to CSU

Hours: 27 hours LEC; 27 hours LAB

Restoration ecology is the science of creation, management, and perpetuation of wildlife habitat. This course will examine this subject through lectures about existing and on-going habitat restoration techniques in the Sacramento area and visits to these restored areas to observe firsthand the restoration methods, management, and success of the sites. Students will have the opportunity to meet the scientists currently working in this field and employing these technologies. Six field trips are required.

BIOL 370 Introduction to Marine Environment 4 Units

Prerequisite: None.

General Education: AA/AS Area IV; CSU Area B2; CSU Area B3; IGETC Area 5B

Course Transferable to UC/CSU

Hours: 54 hours LEC; 54 hours LAB

This course is an introduction to marine biology and oceanography. It includes the study of marine vertebrates and invertebrates, tidepool and coastal ecology, sea water, tides, currents, marine geology, and coastal processes. Instruction includes both lab and lecture, and required field trips to study intertidal plants and animals and coastal ecology. Three field trips are required. Two of these involve tent camping over one two-day and one three-day weekend and will focus on the North and Central California Coast. Field trip dates will be announced at the first class meeting.

BIOL 390 Natural History Field Study .5-4 Units

Prerequisite: None.

Course Transferable to CSU

Hours: 24 hours LEC; 144 hours LAB

Ecology and natural history are covered in the field as well as birds, mammals, fish, insects, reptiles, and amphibians. Plants and geology will be studied and their interrelations investigated. The course will be offered in an appropriate area, and students will be responsible for providing their own lodging, meals, and necessary equipment. Camp sites will be available. This course is ideal for future teachers, parents, resource management majors, and those interested in the biological sciences. Units are awarded based on both lecture and laboratory (one unit per 18 hours lecture or 54 hours laboratory or a combination of lecture and laboratory hours). This course may be taken four times under a new topic or destination.

BIOL 402 Cell and Molecular Biology 5 Units

Prerequisite: Completion of CHEM 400 with a grade of "C" or better, or CHEM 305 and Intermediate Algebra with a grade of "C" or better.

General Education: AA/AS Area IV; CSU Area B2; CSU Area B3; IGETC Area 5B

Course Transferable to UC/CSU

Hours: 54 hours LEC; 108 hours LAB

This is the first semester of a three-semester sequence in general biology designed for biology majors. It is an introduction to many aspects of living cells, with an emphasis on the molecular level of organization. Topics include an introduction to biological molecules, enzymes, cell structure, respiration, photosynthesis, reproduction, genetics and an introduction to statistical analysis. The course also covers molecular genetics, structure and function of viruses, DNA technology and genetic engineering techniques.

BIOL 412 Plant Biology 5 Units

Prerequisite: BIOL 402 or equivalent course with a grade of "C" or better.

General Education: AA/AS Area IV; CSU Area B2; CSU Area B3; IGETC Area 5B

Course Transferable to UC/CSU

Hours: 54 hours LEC; 108 hours LAB

This course is part of a three-semester general biology sequence designed for biology majors. It builds upon and applies concepts developed in Cell and Molecular Biology to the study of plants and general ecology. Topics covered include the diversity, taxonomy, and evolutionary trends observed among the cyanobacteria, algae, fungi, and plants, with special emphasis on higher plants; the comparative anatomy and physiology of higher plants; and general ecology, including population, community, and ecosystem dynamics. Two field trips are required.

BIOL 422 Animal Biology 5 Units

Prerequisite: BIOL 402 or an equivalent college-level Cell and Molecular Biology course with a grade of "C" or better.

General Education: AA/AS Area IV; CSU Area B2; CSU Area B3; IGETC Area 5B

Course Transferable to UC/CSU

Hours: 54 hours LEC; 108 hours LAB

This is part of a three-semester sequence in general biology designed for biology majors. It applies concepts developed in Biology 402 to the study of animals and evolution. Topics covered include animal diversity and classification, comparative anatomy and physiology, animal embryology and development. Additional topics include an introduction to the population genetics, macro- and microevolution, and speciation. Emphasis will be placed on the evolutionary relationships among animals, their adaptations to different environments, and the evolutionary origin of novel characteristics throughout the Animal Kingdom.

BIOL 430 Anatomy and Physiology 5 Units

Prerequisite: CHEM 305 or CHEM 400 with a grade of "C" or better.

Advisory: AH 110 and CHEM 306 with grades of "C" or better.

General Education: AA/AS Area IV; CSU Area B2; CSU Area B3; IGETC Area 5B

Course Transferable to UC/CSU

Hours: 54 hours LEC; 108 hours LAB

This course is an introduction to normal structure and function in humans. The course emphasizes an understanding of physiological principles as related to body structure. The course includes study of the basic principles of physiology and anatomy, general histology, and the integumentary, skeletal, muscular and nervous systems. BIOL 431 follows BIOL 430 and is necessary for completion of the study of human anatomy and physiology.

BIOL 431 Anatomy and Physiology 5 Units

Prerequisite: BIOL 430 or the equivalent with a grade of "C" or better.

Advisory: AH 110 with a grade of "C" or better

General Education: AA/AS Area IV; CSU Area B2; CSU Area B3; IGETC Area 5B

Course Transferable to UC/CSU

Hours: 54 hours LEC; 108 hours LAB

BIOL 431 is the continued study of normal structure and function in humans. Included in the course is the study of the circulatory, respiratory, digestive, urinary, reproductive, and endocrine systems. Special topics included in the course are pH, fluids, and electrolytes.

BIOL 440 General Microbiology 4 Units

Prerequisite: CHEM 400 or CHEM 305 or equivalent with a grade of "C" or better.

General Education: AA/AS Area IV; CSU Area B2; CSU Area B3; IGETC Area 5B

Course Transferable to UC/CSU

Hours: 54 hours LEC; 72 hours LAB

The course includes the study of selected evolutionary, ecological, morphological, physiological, and biochemical aspects of representative micro-organisms. The laboratory includes aseptic technique, metabolism, genetics, and taxonomy. This course is intended for students in allied health majors.

BIOL 444 Water and Wastewater Microbiology 3 Units

Prerequisite: CHEM 326 with a grade of "C" or better

General Education: CSU Area B2

Course Transferable to CSU

Hours: 36 hours LEC; 54 hours LAB

This course includes general concepts in microbiology and cell biology relevant to the role of microorganisms in water and wastewater treatment. Key concepts include selected evolutionary, ecological, morphological, physiological, and biochemical aspects of representative microorganisms found in water and particularly in wastewater. The laboratory includes aseptic techniques, culturing techniques, metabolism, genetics, and taxonomy. This course is intended for students in the Water Treatment Plant Operator or Wastewater Treatment Plant Operator Career Certificate and Mechanical-Electrical Technology Associate of Science Degree programs.

