American River College’s biology program offers courses that satisfy general requirements in natural sciences, and prepares students for transfer opportunities to four-year programs.

General Science

Requirements for Degree Major

Students must complete 18 units of transfer level course work in science in addition to other graduation requirements. Two laboratory courses must be included, one in a physical science and one in a biological. Courses may be selected from anatomy, astronomy, bacteriology, biology, botany, chemistry, geology, physical anthropology, physical geography, physical science, physiology, physics and zoology. See ARC graduation requirements.

Biotechnology

Requirements for Degree 41-42 units

Core Requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
<td>BIOL 310 or 400</td>
<td>4-5</td>
</tr>
<tr>
<td>BIOL 440</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 305 or 400</td>
<td>5</td>
</tr>
<tr>
<td>CHEM 306 or 401</td>
<td>5</td>
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<tr>
<td>CISC 300</td>
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<tr>
<td>ENGR 300</td>
<td>3</td>
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<tr>
<td>ENGR 301, 302, or 342</td>
<td>3</td>
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<tr>
<td>STAT 301</td>
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Concentration Requirements

<table>
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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>BIOT 300</td>
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<tr>
<td>BIOT 307</td>
<td>2</td>
</tr>
<tr>
<td>BIOT 315</td>
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and 2 units from the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
<td>BIOL 498</td>
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or 2 units from the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
<td>BIOT 305 (1 unit) and BIOL 498 (1 unit)</td>
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<tr>
<td>BIOT 310 (1 unit) and BIOL 498 (1 unit)</td>
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Recommended Electives

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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>GESA 305, 315, 320; CISC 305; PHIL 310; PHYS 350, 360; SPEECH 301</td>
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Requirements for Certificate 32-33 units

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
<td>BIOL 310 or 400</td>
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<tr>
<td>BIOL 440</td>
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<tr>
<td>BIOT 300</td>
<td>4</td>
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<tr>
<td>BIOT 315</td>
<td>5</td>
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<tr>
<td>CHEM 305 or 400</td>
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<tr>
<td>CISC 300</td>
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<td>ENGR 300</td>
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<tr>
<td>MATH 120</td>
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and one of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
<td>BIOT 305</td>
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<tr>
<td>BIOT 307</td>
<td>2</td>
</tr>
<tr>
<td>BIOT 310</td>
<td>1</td>
</tr>
<tr>
<td>BIOT 498</td>
<td>1-2</td>
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</tbody>
</table>

General Education Graduation Requirements: In addition to completing the degree requirements, students must also complete the general education graduation requirements for an A.A./A.S. degree. See ARC graduation requirements.

BIOL 102  Introduction to Concepts of Human Anatomy and Physiology 4 Units

Prerequisite: None

Hours: 54 hours LEC, 54 hours LAB

This course examines body systems from an anatomical and physiological point of view. It meets the minimum requirements for licensed vocational nursing, paramedic, gerontology, and funeral services programs. The basic anatomy and physiology of all the body systems will be covered with an emphasis on developing vocabulary in each area. Activities will include microscope work, simple physiology experiments and demonstrations, and using models and simple dissections to learn anatomy. AA/AS area A

BIOL 115  Basic Anatomy and Physiology 3 Units

Formerly: BIOL 50

Prerequisite: None

Hours: 54 hours LEC

This course provides instruction involving basic human anatomy and physiology of the skin, skeletal, muscular, nervous, circulatory and lymphatic systems. It is designed for medical assisting majors, medical secretaries and other health-related technologies. Together BIOL 115 and 116 compose a complete study of the basic anatomy and physiology of the human body. AA/AS area A.

BIOL 116  Basic Anatomy and Physiology 3 Units

Formerly: BIOL 51

Prerequisite: None

Hours: 54 hours LEC

This course provides instruction involving basic human anatomy and physiology. This course is designed for medical assisting majors, medical secretaries, and other health-related technologies. It covers body organization, basic chemistry, cells, and tissues. In addition, BIOL 116 covers respiratory, digestive, urinary, endocrine, and reproductive systems. Either BIOL 115 or 116 may be taken first, however, both courses are necessary for a complete study of human anatomy and physiology. AA/AS area A.
BIOL 117  Basic Anatomy and Physiology Lab  1 Unit
Formerly: BIOL 50L
Prerequisite: None
Corequisite: BIOL 115.
Hours: 54 hours LAB
This course is an optional introductory laboratory course in basic human anatomy and physiology designed to complement the lecture course, BIOL 115. It is designed for medical assisting, medical records, and hazardous materials technician majors, and other health-related technologies. This course is not acceptable in most nursing and respiratory care programs.

BIOL 118  Basic Anatomy and Physiology Laboratory  1 Unit
 Formerly: BIOL 51L
Prerequisite: None
Corequisite: BIOL 116.
Hours: 54 hours LAB
This course is an optional introductory laboratory course in basic human anatomy and physiology designed to complement the lecture course BIOL 116. It is designed for medical assisting, medical records, and hazardous materials technician majors, and other health-related technologies. It is not acceptable in most nursing and respiratory care programs.

BIOL 130  Microbiology for Funeral Services  3 Units
Prerequisite: CHEM 130.
Hours: 54 hours LEC
This course will include a survey of the basic principles of microbiology. It relates these principles to Funeral Service Education especially as they pertain to sanitization, disinfection, community health and embalming practice.

BIOL 300  The Foundations of Biology  3 Units
Formerly: BIOL 12
Prerequisite: None
Course Transferable to UC/CSU
Hours: 54 hours LEC
This non-majors course covers basic biological principles and how they relate to humans. Concepts included are introduction and philosophy of science, cell chemistry, structure, and physiology; genetics (transmission and molecular); biotechnology; human body systems; evolution; reproduction and development; ecology; and human impacts on the environment. Field trips may be required. AA/AS area 3A; CSU area B2; IGETC area 5B.

BIOL 303  Survey of Biology  4 Units
Formerly: BIOL 5
Prerequisite: None
Course Transferable to UC/CSU
Hours: 54 hours LEC, 54 hours LAB
This course covers biological principles with special emphasis on the major groups of organisms and the structure and function of their organ systems. Ecology; genetics, and evolution will be included. Plant and animal dissection may be an integral part of the laboratory sessions. Field trips required. Appropriate for Liberal Studies, Elementary Education, Environmental Studies, Recreation and other majors requiring BIOL 303. Not appropriate for science majors and those having completed ARC's Biology 310, without counselor's approval. AA/AS area A; CSU area B2.

BIOL 305  Natural History  4 Units
Formerly: BIOL 10
Prerequisite: None
Course Transferable to UC/CSU
Hours: 54 hours LEC, 54 hours LAB
This course covers basic ecological and biological principles in order to understand the origin and diversity of living organisms. Topics range from landscape formation and habitats to the adaptations organisms have evolved to live in their environment. Although this is a broad survey course, emphasis will be placed on the animal kingdom and on local environments. A variety of field trips opportunities allow students to study the diversity of life around them. Dissection is not part of this course. Designed as non-majors, introductory course and for those who enjoy the outdoors. AA/AS area 3A; CSU area B2; IGETC area 5B.

BIOL 310  General Biology  4 Units
Formerly: BIOL 16
Prerequisite: None
Course Transferable to UC/CSU
Hours: 54 hours LEC; 54 hours LAB
This non-majors laboratory course covers basic biological principles and how they relate to humans. Concepts included are cell chemistry, structure, and physiology; genetics (transmission and molecular); biotechnology; human body systems; evolution; reproduction and development; ecology; and human impacts on the environment. Field trips may be required. No dissection is required. AA/AS area A; CSU area B2; IGETC area 5B.

BIOL 320  Field Botany  3 Units
Formerly: BIOL 21
Prerequisite: None
Course Transferable to CSU
Hours: 36 hours LEC; 54 hours LAB
This course covers identification, sight recognition and ecological relationships of native vascular plants of California. Plant keys and principles of taxonomy are stressed to develop proficiency in identification of plant species. This course covers some of society's historical uses of native plants. Frequent field trips and a plant collection are required.

BIOL 322  Ethnobotany  3 Units
Formerly: BIOL 23
Prerequisite: None
Course Transferable to UC/CSU
Hours: 54 hours LEC
The focus of this introductory course is the multicultural use of plants. Emphasis is on the identification and use of plants from several cultures including the American Indians, Europeans, South Americans, and Chinese. Topics include the use of plants for food, medicine, basketry, technology, shelter, and music. Site recognition and plant use will be emphasized. An analysis of ethnicity and ethnocentrism is included. AA/AS area F.

BIOL 330  Natural History of Insects  3 Units
Formerly: BIOL 8
Prerequisite: None
Course Transferable to UC/CSU
Hours: 54 hours LEC
This course provides an introduction to the science of Entomology. Approximately 75% of all known species of animals are insects, therefore, they often have a profound effect on human civilization. This class details their great variety, structures and function, habitats, and their significance to plants and animals, including humans. Opportunities for field investigations will be provided.

BIOL 332  Introduction to Ornithology  2 Units
Formerly: BIOL 20
Prerequisite: None
Course Transferable to CSU
Hours: 18 hours LEC; 54 hours LAB
This course covers the structure, physiology, ecology, behavior, reproduction and classification of birds. Field trips are required during class time to study bird identification, behavior and ecology.

BIOL 342  The New Plagues: New and Ancient Infectious Diseases Threatening World Health  3 Units
Formerly: BIOL 34
Prerequisite: None
Course Transferable to UC/CSU
Hours: 54 hours LEC
This course will explore the biology, epidemiology and pathology of selected pathogens such as prions, viruses, bacteria protozoa, and helminthes threatening public health on a global scale. The course explores the influence of human behavior and activities on the emergence of new infectious agents and the re-emergence of ancient plagues.
BIOL 350  Environmental Biology  3 Units
Formerly: BIOL 14
Prerequisite: None
Course Transferable to UC/CSU
Hours: 54 hours LEC; 108 hours LAB
A survey course covering the management of soil, water, forest, mineral and energy resources as well as wildlife management and conservation. Case studies involving both national and local problems will enhance the study of human-environment interactions. Field trips and a semester project may be required.

BIOL 352  Conservation Biology  3 Units
Formerly: BIOL 18
Prerequisite: None
Course Transferable to UC/CSU
Hours: 54 hours LEC
This introductory course covers biological and ecological principles involved in understanding and analyzing environmental problems and exploring scientifically sound conservation techniques. Major topics include the nature of science, population dynamics and distributions, evolution and species extinction, biodiversity, ecosystem functions, and the interdependence between humans and our environment. This course places emphasis on the scientific processes and methodology. Statewide and local environments will be highlighted. Field trips and a semester project may be required. AA/AS area A; CSU area B2; IGETC area 5B.

BIOL 370  Introduction to Marine Environment  4 Units
Formerly: BIOL 15
Prerequisite: None
Course Transferable to UC/CSU
Hours: 54 hours LEC; 72 hours LAB
This course is an introduction to oceanography and marine biology. It includes the study of seawater, marine geology, marine algae, marine vertebrate and invertebrate animals, and the ecology of various marine zones. Field trips focusing on the Central California coast are required. AA/AS area A; CSU area B2; IGETC area 5B.

BIOL 390  Natural History Field Study  5-4 Units
Formerly: BIOL 24
Prerequisite: None
Course Transferable to UC/CSU
Hours: 3-24 hours LEC; 18-144 hours LAB
This course covers the ecology and natural history of specific areas (mountains, deserts, tide pools, etc.). Course content will vary according to field destination but may include topics in botany, zoology, marine biology, conservation, and natural history. Field study methodology and tools may also be covered. Students will be responsible for providing their own lodging or camping equipment and meals when needed. Field trips required. This course may be taken up to four times for a maximum of eight units.

BIOL 400  Principles of Biology  5 Units
Formerly: BIOL 1A
Prerequisite: Any transfer level chemistry course with a grade of "C" or better.
Advisory: ENGR 116, and ENGWR 102 or 103; or ESL 130 and ESLR 320 with a grade of "C" or better.
Course Transferable to UC/CSU
Hours: 54 hours LEC; 108 hours LAB
This is an introductory course covering biological concepts and ideas. The focus is on the basic principles common to all forms of life and the philosophy of science. These include cell structure and function, cell physiology, reproduction, Mendelian and molecular genetics, evolution and ecology. (CAN BIOL 2) AA/AS area A; CSU area B2; IGETC area 5B; (BIOL SEQ A Sum of CAN BIOL 400, 420 & 410). (BIOL SEQ A Sum of CAN BIOL 2, 4, and 6)

BIOL 410  Principles of Botany  5 Units
Formerly: BIOL 2
Prerequisite: BIOL 400 with a grade of "C" or better.
Course Transferable to UC/CSU
Hours: 54 hours LEC; 108 hours LAB
This course covers the general principles of botany for science majors. The emphasis is on anatomy, morphology, life cycles, embryology and physiology of plants and on a plant kingdom survey. All laboratory work includes instructor-directed lecture-discussion consisting of an introduction and analysis of the data and ideas covered. One field trip is required. (CAN BIOL 6) IGETC area 5B; CSU area B2; (BIOL SEQ A Sum of CAN BIOL 400, 420 and 410).

BIOL 420  Principles of Zoology  5 Units
Formerly: BIOL 3
Prerequisite: BIOL 400 with a grade of "C" or better.
Course Transferable to UC/CSU
Hours: 54 hours LEC; 108 hours LAB
This course covers principles of zoology. The course is designed to give students a broad understanding of the development, individual characteristics, and relationships of the various phyla. Topics covered include: a survey of the animal kingdom, embryology, evolution, systematics, and comparative anatomy and physiology. One or two field trips per semester are required. (CAN BIOL 4) IGETC area 5B; CSU area B2; (BIOL SEQ A Sum of CAN BIOL 400, 420 and 410).

BIOL 430  Anatomy and Physiology  5 Units
Formerly: BIOL 25
Prerequisite: CHEM 305 or 400 with a grade of "C" or better.
Course Transferable to UC/CSU
Hours: 54 hours LEC; 108 hours LAB
This course provides instruction on the principles of human anatomy and physiology emphasizing the integration of structure and function. The topics covered are anatomical terminology, chemistry, cells, histology, articulations and the integumentary, skeletal, muscular and nervous systems. Both BIOL 430 and 431 must be taken to study all of the major body systems. AA/AS area A; (BIOL SEQ B Sum of CAN BIOL 430 and 431).

BIOL 431  Anatomy and Physiology  5 Units
Formerly: BIOL 26
Prerequisite: BIOL 430 with a grade of "C" or better.
Course Transferable to UC/CSU
Hours: 54 hours LEC; 108 hours LAB
This course covers the principles of human anatomy and physiology emphasizing the integration of structure and function. It includes the following systems: cardiovascular, lymphatic, respiratory, digestive, urinary, endocrine and reproductive. Both BIOL 430 and 431 must be taken to study all of the major body systems. AA/AS area A; (BIOL SEQ B Sum of CAN BIOL 430 and 431).

BIOL 440  General Microbiology  4 Units
Formerly: BIOL 6
Prerequisite: CHEM 305 or 400 with a grade of "C" or better.
Course Transferable to UC/CSU
Hours: 54 hours LEC; 72 hours LAB
This course introduces microorganisms and their effects on human health. The course examines the structure, physiology, metabolism, and genetics of microorganisms. Laboratory work includes aseptic technique, morphological and biochemical properties of microorganisms, and medically relevant issues regarding microorganisms. (CAN BIOL 14) CSU area B2; IGETC area 5B.

BIOL 442  General Bacteriology  5 Units
Formerly: BIOL 4
Prerequisite: CHEM 305 or 400 with a grade of "C" or better.
Course Transferable to UC/CSU
Hours: 54 hours LEC; 108 hours LAB
This course provides a survey of bacteria and viruses, examining bacterial structure, physiology, metabolism, and genetics and viral structure and replication. Laboratory work introduces methods for culturing and characterizing microorganisms and explores the properties of microorganisms in various habitats. CSU area B2; IGETC area 5B.

BIOL 460  Biology of Cancer  3 Units
Formerly: BIOL 27
Prerequisite: None
Course Transferable to UC/CSU
Hours: 54 hours LEC
This course is a biological introduction to cancer which covers topics such as the pathology of cancer, the types of cancer, causes of cancer due to natural or environmental causes, methods of identifying cancer, cancer treatment and the psychological and social impact of cancer on its victims, their families, and society.

**BIOL 468  Mammals of Africa**  2 Units  
Formerly: BIOL 38  
Prerequisite: None  
Course Transferable to CSU  
Hours: 36 hours LEC  
This course covers the evolutionary adaptation of African mammals to their environment. Topics include some of the unique types of biological traits that mammals have to survive in the Serengeti ecosystem. The physiology, behavior and physiques of various mammalian groups such as primates, antelopes, elephants, and large cats will be covered. Conservation issues of the Serengeti ecosystem will be an integral part of this course.

**BIOL 480  Biology/Chemistry Honors Seminar**  1 Unit  
Formerly: BIOL 9H  
Prerequisite: CHEM 400 with a grade of “C” or better; BIOL 400 with a grade of “C” or better; ENGR 300 or 480 with a grade of “C” or better; 3.0 cumulative GPA.  
Course Transferable to CSU  
Course Transferable to UC  
Hours: 18 hours LEC  
This honors section will provide a seminar approach for advanced students of general chemistry and biology to discuss and analyze in-depth recent scientific articles in terms of the chemical and biological principles introduced in these curricula. Not open to students who have taken CHEM 482. May be taken twice.

**BIOL 482  Honors Introduction to Marine Environment**  4 Units  
Formerly: BIOL 15H  
Prerequisite: Cumulative GPA of 3.0 or above, ENGR 300 or 480 with a grade of “C” or better.  
Course Transferable to UC/CSU  
Hours: 54 hours LEC, 54 hours LAB  
This course presents an honors level introduction to marine biology. Using a seminar style, selected topics in marine zoology, botany and ecology will be explored. In addition to the topics presented in BIOL 370, this honors course will include additional studies in cell biology, experimental design, the developmental planning of marine conservation, journal critiques, and applied research based on independent or collaborative field experiments. Field trips focusing on inter-tidal organisms of the Central California Coast are required. AA/AS area A; CSU area B2.

**BIOL 490  Science Skills and Applications**  .5 Units  
Formerly: BIOL 39  
Prerequisite: None  
Corequisite: Current enrollment in a Biology course.  
Course Transferable to CSU  
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. Credit/No Credit. Registration is open through the twelfth week of the semester. May be taken four times for a maximum of two units.

**BIOT 305  Introduction to Bioinformatics**  1 Unit  
Formerly: BIOL 41  
Prerequisite: BIOL 310 or 400 with a grade of “C” or better.  
Advisory: BIOT 300 and CISC 305.  
Course Transferable to CSU  
Course Transferable to UC  
Hours: 14 hours LEC; 14 hours LAB  
This course includes topics on biology databases, search and retrieval programs, structure/function analysis of biological molecules, DNA sequence alignment and analysis, and applications of these technologies.

**BIOT 306  Computer Applications in Bioinformatics**  3 Units  
Prerequisite: BIOT 305 with a grade of “C” or better.  
Course Transferable to CSU  
Course Transferable to UC  
Hours: 36 hours LEC; 54 hours LAB  
This course introduces computation concepts and methods used in bioinformatics. It addresses issues in genomics and proteomics, such as sequence alignment, gene recognition and regulation, and protein modeling. The course examines software and programming tools used to access and manipulate biological database information, especially nucleic acid and protein data.

**BIOT 307  Biotechnology and Society**  2 Units  
Formerly: BIOL 44  
Prerequisite: None  
Course Transferable to UC/CSU  
Hours: 36 hours LEC  
This course focuses on the emerging impact of biotechnology on society. Basic concepts in biotechnology are introduced in a non-technical manner to explore advances in medicine, agriculture, and other fields. Public perception and ethical issues in biotechnology are also emphasized.

**BIOT 310  Polymerase Chain Reaction (PCR) Methods**  1 Unit  
Formerly: BIOL 42  
Prerequisite: BIOT 300.  
Course Transferable to CSU  
Course Transferable to UC  
Course Transferable to UC/CSU  
Hours: 14 hours LEC; 14 hours LAB  
This course provides training in techniques involving the polymerase chain reaction (PCR). Topics include PCR protocols, troubleshooting, and applications to medicine, forensics, and agriculture.

**BIOT 315  Methods in Biotechnology**  5 Units  
Formerly: BIOL 43  
Prerequisite: BIOT 300.  
Course Transferable to CSU  
Course Transferable to UC  
Course Transferable to UC/CSU  
Hours: 54 hours LEC; 108 hours LAB  
This course provides specialized laboratory skills and theory in biotechnology. Topics include aseptic technique, preparation of media and solutions, methods in bacteria and plant tissue culture, isolation and analysis of nucleic acids and proteins, good laboratory practice and quality control.

**BIOT 498  Work Experience in Biotechnology**  1-2 Units  
Prerequisite: BIOL 300 with a grade of “C” or better.  
Course Transferable to CSU  
Course Transferable to UC/CSU  
Course Transferable to UC  
Hours: 9 hours LEC; 60-150 hours LAB  
This course provides directed work experience in the biotechnology industry with the purpose of applying classroom instruction to the biotechnology workplace. Class enrollment is dependent upon availability of paid or volunteer work experience in a biotechnology-related environment.