

Area: Science and Engineering
 Dean: Dr. Rina Roy
 Phone: (916) 484-8107
 Counseling: (916) 484-8572

Degree: A.S. for Transfer - Biology
 A.S. - Biotechnology
 A.S. - General Science
 Certificate: Biotechnology

Biologists are fully engaged in meeting the challenges of the future, helping to improve the quality of human life and preserve our world's biodiversity. The Biology courses at ARC provide students with the breadth and depth of knowledge necessary to more fully understand the living world. The Biology Department offers a wide range of lecture, laboratory, and field courses for majors and non-majors alike, whether for transfer, vocational training, or general interest.

DEGREES AND CERTIFICATES

Biology A.S. for Transfer Degree

Major Code, IGETC: 011095A01
 Major Code, IGETC: 011095A02

The Associate in Science in Biology for Transfer degree provides students with a major that fulfills the general requirements of the California State University for transfer. Students with this degree will receive priority admission with junior status to the California State University system. The Associate in Science in Biology for Transfer (AS-T) degree may be obtained by the completion of 60 transferable, semester units with a minimum 2.0 GPA, including (a) the major or area of emphasis described in the Required Program outlined below (earning a C or better in these courses) and (b) the Intersegmental General Education Transfer Curriculum for Science, Technology, Engineering, and Mathematics (IGETC-STEM).

Student Learning Outcomes

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

- apply the scientific method: define problems clearly, construct testable hypotheses, design and execute appropriate experiments, analyze data, and justify appropriate conclusions.
- demonstrate knowledge of scientific terminology and interpret principle concepts of biology.
- demonstrate content knowledge, laboratory skills, and study skills to be successful at a four-year institution.
- record and analyze data using appropriate laboratory skills and instrumentation.
- assemble and critically evaluate technical information from the scientific literature.
- apply safe laboratory practices.
- work effectively in groups, as leaders or team members, to solve problems and interact productively with a diverse group of peers.
- demonstrate awareness of the role of biology in contemporary societal and global issues.

Requirements for Degree

32-39 Units

BIOL 400	Principles of Biology	5
BIOL 415	Introduction to Biology: Biodiversity, Evolution, and Ecology (5)	5 - 10
or [BIOL 410 and BIOL 420	Principles of Botany (5) Principles of Zoology (5)]	
CHEM 400	General Chemistry I	5
CHEM 401	General Chemistry II	5
MATH 355	Calculus for Biology and Medicine I (4)	4 - 5
or MATH 400	Calculus I (5)	
[PHYS 350	General Physics (4)	8 - 9
and PHYS 360	General Physics (4)]	
or [PHYS 410	Mechanics of Solids and Fluids (5)	
and PHYS 421	Electricity and Magnetism (4)]	

Associate in Science for Transfer Degree: The Associate in Science in Biology for Transfer (AS-T) degree may be obtained by completion of 60 transferable, semester units with a minimum 2.0 GPA, including (a) the major or area of emphasis described in the Required Program, and (b) the Intersegmental General Education Transfer Curriculum for Science, Technology, Engineering, and Mathematics (IGETC for STEM).

Biotechnology Degree

Major Code: 011517A01

This degree provides the theory and skills necessary for entry into the biotechnology field, which uses cellular and molecular processes for industry or research. Course work includes practical laboratory skills with emphasis on good laboratory practice, quality control, and regulatory issues in the biotechnology workplace. Completion of the degree also prepares the student for transfer at the upper division level to academic programs involving biotechnology.

Student Learning Outcomes

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

- apply biological and chemical concepts to biotechnology research and its practical applications.
- demonstrate biotechnology laboratory procedures involving protein and DNA techniques, cell culture methods, and solution preparation.
- design and interpret experiments involving biotechnology laboratory procedures.
- evaluate biotechnology laboratory practices in the context of good laboratory practice, quality control, and regulatory issues.
- analyze biotechnology data using mathematical and statistical methods.
- integrate laboratory skills and theory into job-related tasks in the biotechnology workplace.
- appraise social and ethical issues related to advances in biotechnology research and its practical applications.

Career Opportunities

This degree prepares the student for entry-level work in the bioscience industry in the areas of research and development, production, clinical testing, and diagnostic work. Potential employers include biotechnology and pharmaceutical companies, as well as laboratories in hospitals, government, and universities.

Requirements for Degree		29-35 Units
BIOL 400	Principles of Biology (5)	4 - 5
or BIOL 440	General Microbiology (4)	
or BIOL 442	General Microbiology and Public Health (5)	
BIOT 301	Biotechnology and Human Health	3
BIOT 307	Biotechnology and Society	2
BIOT 311	Biotechnology Laboratory Methods - Molecular Techniques	2
BIOT 312	Biotechnology Laboratory Methods - Microbial and Cell Culture Techniques	2
[CHEM 305	Introduction to Chemistry (5)	5 - 10
and CHEM 306	Introduction to Chemistry (5)]	
or CHEM 309	Integrated General, Organic, and Biological Chemistry (5)	
or [CHEM 400	General Chemistry I (5)	
and CHEM 401	General Chemistry II (5)]	
ENGWR 300	College Composition	3
ENGWR 301	College Composition and Literature (3)	3
or ENGWR 302	Advanced Composition and Critical Thinking (3)	
STAT 300	Introduction to Probability and Statistics	4
And a minimum of 1 unit from the following:		1
BIOT 498	Work Experience in Biotechnology (1 - 4)	
or BIOT 305	Introduction to Bioinformatics (1)	

Associate Degree Requirements: The Biotechnology Associate in Science (A.S.) Degree may be obtained by completion of the required program, plus general education requirements, plus sufficient electives to meet a 60-unit total. See ARC graduation requirements.

Biotechnology Certificate

Major Code: 011416C01

This certificate provides the theory and skills necessary for entry into the biotechnology field, which uses cellular and molecular biology processes for industry or research. Course work includes practical laboratory skills with emphasis on good laboratory practice, quality control, and regulatory issues in the biotechnology workplace. This certificate is suitable for preparing the student for the biotechnology workplace at the support personnel level.

Student Learning Outcomes

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

- apply biological and chemical concepts to biotechnology research and its practical applications.
- demonstrate biotechnology laboratory procedures involving protein and DNA techniques, cell culture methods, and solution preparation.
- design and interpret experiments involving biotechnology laboratory procedures.
- evaluate biotechnology laboratory practices in the context of good laboratory practice, quality control, and regulatory issues.
- assess the impact of biotechnology on social and ethical issues.

Career Opportunities

This program prepares the student for entry-level work in the bioscience industry in the areas of research and development, production, clinical testing, and diagnostic work. Potential employers include biotechnology and pharmaceutical companies, as well as laboratories in hospitals, government, and universities.

See losrios.edu/gainful-emp-info/gedt.php?major=011416C01 for Gainful Employment Disclosure.

Requirements for Certificate		24-26 Units
BIOL 303	Survey of Biology (4)	4 - 5
or BIOL 310	General Biology (4)	
or BIOL 400	Principles of Biology (5)	
or BIOL 440	General Microbiology (4)	
or BIOL 442	General Microbiology and Public Health (5)	
BIOT 301	Biotechnology and Human Health	3
BIOT 311	Biotechnology Laboratory Methods - Molecular Techniques	2
BIOT 312	Biotechnology Laboratory Methods - Microbial and Cell Culture Techniques	2
CHEM 305	Introduction to Chemistry (5)	5
or CHEM 309	Integrated General, Organic, and Biological Chemistry (5)	
or CHEM 400	General Chemistry I (5)	
ENGWR 300	College Composition	3
MATH 120	Intermediate Algebra (5)	4 - 5
or STAT 300	Introduction to Probability and Statistics (4)	
And a minimum of 1 unit from the following:		1
BIOT 305	Introduction to Bioinformatics (1)	
or BIOT 307	Biotechnology and Society (2)	
or BIOT 498	Work Experience in Biotechnology (1 - 4)	

General Science Degree

Major Code: 011229A01

This program provides a broad study in the fields of biological and physical sciences in preparation for transfer to a four-year program and continuation of studies in upper division science courses.

Student Learning Outcomes

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

- evaluate new and accepted ideas about the natural universe using scientific methods.
- analyze a wide variety of natural phenomena using basic definitions and fundamental theories of biological or physical sciences.
- apply appropriate quantitative and qualitative methods to interpret and analyze pertinent data.
- outline the basic concepts and fundamental theories of a natural science.
- articulate orally and/or in writing the importance of continuous examination and modification of accepted ideas as a fundamental element in the progress of science.
- discuss ethical components of scientific decision making and apply personal and social values within the process of decision making in scientific endeavors.

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(General Science Degree continued)

Requirements for Degree **18 Units**

A minimum of 18 units from the following:..... 18¹

Physical Science Courses:

ASTR	300, 310, 320, 330, 400, 481, 495, 499
CHEM	305, 306, 309, 310, 400, 401, 420, 421, 423, 495, 499
GEOG	300, 301, 305, 306, 307, 308, 309, 391, 392, 393, 394, 495, 499
GEOL	300, 301, 305, 306, 310, 311, 320, 325, 330, 331, 345, 390, 495, 499
PHYS	310, 311, 312, 350, 360, 410, 421, 431, 495, 499
PS	300, 301, 495, 499

Biological Science Courses:

ANTH	300, 301, 303, 370, 372, 480, 495, 499
BIOL	300, 301, 303, 305, 310, 322, 332, 342, 352, 370, 375, 390, 400, 410, 415, 420, 430, 431, 440, 442, 482, 495, 499
BIOT	301, 305, 307, 311, 312, 499
NATR	300, 302, 303, 304, 305, 306, 307, 310, 320, 322, 324, 330, 332, 346, 495, 499
PSYC	310, 311, 495, 499

¹must be transfer-level and must include one laboratory course in a physical science and one laboratory course in a biological science

Associate Degree Requirements: The General Science Associate in Science (A.S.) Degree may be obtained by completion of the required program, plus general education requirements, plus sufficient electives to meet a 60-unit total. See ARC graduation requirements.

Biology

BIOL 102 Essentials of Human Anatomy and Physiology **4 Units**

*General Education: AA/AS Area IV
Hours: 54 hours LEC; 54 hours LAB*

This course examines body systems from an anatomical and physiological point of view. The basic anatomy and physiology of all the body systems are covered with an emphasis on developing vocabulary in each area. This course meets the minimum science requirements for Paramedic, Healthcare Interpreting, Gerontology, Health Care, and Funeral Service programs.

BIOL 103 Human Anatomy for Funeral Services **4 Units**

*Corequisite: FSE 300
Enrollment Limitation: An off-site clinical laboratory component of the course may require a background check, drug screening, and testing for hepatitis B.
General Education: AA/AS Area IV
Hours: 54 hours LEC; 54 hours LAB*

This course is an intensive study of the structure of the human body. It covers the basic terminology of anatomy, microscopic anatomy, the four major tissue types, and all the organ systems of the human body. Topics include the following systems: integumentary, skeletal, muscular, nervous, cardiovascular, respiratory, digestive, urinary, and reproductive. Laboratory assignments develop skills of observation, investigation, and identification of selected structures. It emphasizes the regions and structures relevant to embalming techniques through the dissection of a human cadaver. This course is designed for students preparing for a career in funeral service.

BIOL 130 Microbiology for Funeral Services **3 Units**

*Prerequisite: CHEM 130 with a grade of "C" or better
Corequisite: FSE 312, 330, and 340
Advisory: BIOL 300 with a grade of "C" or better
Hours: 54 hours LEC*

This course covers a survey of the basic principles of microbiology. It relates these principles to Funeral Service Education especially as they pertain to sanitation, disinfection, public health, infectious disease, and embalming practice.

BIOL 295 Independent Studies in Biology **1-3 Units**

*Prerequisite: None
Hours: 54-162 hours LAB*

Independent Study is an opportunity for the student to extend classroom experience in this subject, while working independently of a formal classroom situation. Independent study is an extension of work offered in a specific class in the college catalog. To be eligible for independent study, students must have completed the basic regular catalog course at American River College. They must also discuss the study with a professor in this subject and secure approval. Only one independent study for each catalog course will be allowed.

BIOL 300 The Foundations of Biology **3 Units**

*Advisory: Eligible for ENGRD 310 or ENGRD 312 AND ENGWR 300; OR ESLR 340 AND ESLW 340.
General Education: AA/AS Area IV; CSU Area B2; IGETC Area 5B
Course Transferable to UC/CSU
Hours: 54 hours LEC*

This course for non-science majors covers basic biological principles and how they relate to humans. Topics include an introduction to the philosophy of science and basic cell chemistry, structure, and physiology. An introduction to basic genetics (transmission and molecular) as well as some biotechnology principles are discussed. Additionally, human body systems, evolution, reproduction and development, as well as ecology and human impacts on the environment are addressed.

BIOL 301 Evolution **3 Units**

*Advisory: Eligible for ENGRD 310 or ENGRD 312 AND ENGWR 300; OR ESLR 340 AND ESLW 340.
General Education: AA/AS Area IV; CSU Area B2; IGETC Area 5B
Course Transferable to UC/CSU
Hours: 54 hours LEC*

This non-science majors course is an introduction to evolutionary biology. It explores the history of life and the mechanisms that give rise to the diversity of life on earth. Topics include the scientific method, the history of evolutionary thought, the origins of life, population genetics, speciation, evolutionary developmental biology and systematics.

BIOL 303 Survey of Biology **4 Units**

*Advisory: MATH 100 or 132 with a grade of "C" or better
General Education: AA/AS Area IV; CSU Area B2; CSU Area B3; IGETC Area 5B; IGETC Area 5C
Course Transferable to UC/CSU
Hours: 54 hours LEC; 54 hours LAB*

This course covers the basic principles of cell biology, genetics (transmission and molecular), ecology, and evolution. It also emphasizes the process of science, interrelationships among living organisms, and the relationship of biological structures and functions. Laboratory activities include plant and animal dissection. This course provides science preparation for those entering a Multiple Subject Teacher Credential Program. Field trips are required.

BIOL 305 Natural History**4 Units**

Advisory: Eligible for ENGRD 310 or ENGRD 312 AND ENGWR 300; OR ESLR 340 AND ESLW 340

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

IGETC Area 5B; IGETC Area 5C

Course Transferable to UC/CSU

Hours: 54 hours LEC; 54 hours LAB

This course covers basic biological and ecological principles to explain 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, it emphasizes California environments. Dissection is not part of this curriculum. This course is designed as an introductory course and for non-majors who enjoy the outdoors. Field trips may be required.

BIOL 310 General Biology**4 Units**

Advisory: MATH 32, MATH 42, or STAT 105 with a grade of "C" or better; and eligible for ENGRD 310 or ENGRD 312 AND ENGWR 300; OR ESLR 340 AND ESLW 340.

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

IGETC Area 5B; IGETC Area 5C

Course Transferable to UC/CSU

Hours: 54 hours LEC; 54 hours LAB

This laboratory course for non-science majors covers basic biological principles and how they relate to humans. Concepts include cell chemistry, structure, and physiology; genetics (transmission and molecular); biotechnology; human body systems; evolution; reproduction and development; ecology; and human impacts on the environment.

BIOL 322 Ethnobotany**3 Units**

General Education: AA/AS Area VI

Course Transferable to UC/CSU

Hours: 36 hours LEC; 54 hours LAB

This course focuses on 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. Sight recognition of plants is emphasized. An analysis of ethnicity and ethnocentrism is also included. Field trips may be required.

BIOL 332 Introduction to Ornithology**4 Units**

Advisory: Eligible for ENGRD 310 or ENGRD 312 AND ENGWR 300; OR ESLR 340 AND ESLW 340.

General Education: AA/AS Area IV

Course Transferable to UC/CSU

Hours: 54 hours LEC; 54 hours LAB

This introductory course covers the biology and natural history of birds. Topics include evolutionary origins of birds and of flight, avian anatomy and physiology, and bird behavior, such as migration, song, feeding ecology, and mating systems. Conservation strategies are also investigated. Laboratory work explores bird structure and function, taxonomic classification, and species identification, particularly of those found in California and the western United States. Field trips are required.

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

Advisory: Eligible for ENGRD 310 or ENGRD 312 AND ENGWR 300; OR ESLR 340 AND ESLW 340

General Education: CSU Area B2; IGETC Area 5B

Course Transferable to UC/CSU

Hours: 54 hours LEC

This course explores the biology, epidemiology, and pathology of selected pathogens such as prions, viruses, bacteria, protozoa, fungi, and helminths that threaten public health on a global scale. It explores the interaction between human behavior and disease agents on the emergence of new infectious agents and the re-emergence of ancient plagues.

BIOL 352 Conservation Biology**3 Units**

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

Course Transferable to UC/CSU

Hours: 54 hours LEC

This course introduces biological and ecological principles involved in understanding and analyzing environmental problems and exploring scientifically sound conservation approaches. Major topics include forms and patterns of biodiversity, values of biodiversity, threats to biodiversity, conservation at the population and species levels, applied conservation biology, and conservation and sustainable development at the local, regional, national, and international levels. This course places emphasis on scientific processes and methodology, while also examining the economic, social, political, and ethical aspects of conservation issues. Course themes are explored through extensive use of interactive case studies, discussion, and activities surrounding relevant current events. Field trips may be required.

BIOL 370 Marine Biology**4 Units**

Advisory: Eligible for ENGRD 310 or ENGRD 312 AND ENGWR 300; OR ESLR 340 AND ESLW 340.

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

IGETC Area 5B; IGETC Area 5C

Course Transferable to UC/CSU

Hours: 54 hours LEC; 54 hours LAB

This course is an introduction to marine biology. It includes the study of cell biology, evolution, physical oceanography, marine algae, marine vertebrate and invertebrate animals, and the ecology of various marine zones. Field trips focusing on the Central and Northern California coast are required and serve as the laboratory component of this course. Field experiences may include but are not limited to natural history of the rocky intertidal, invertebrate identification, salt marsh ecology, sandy beach ecology, or estuary ecology. This course is not open to students who have completed BIOL 482.

BIOL 375 Marine Ecology**3 Units**

Advisory: MATH 32, MATH 42, or STAT 105 with a grade of "C" or better; and eligible for ENGRD 310 or ENGRD 312 AND ENGWR 300; OR ESLR 340 AND ESLW 340.

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

Course Transferable to UC/CSU

Hours: 54 hours LEC

This course for non-science majors is an introduction to the marine physical environment, the diversity of marine life, and the complex interactions between the two. It uses the marine environment as a model for introducing the key concepts of the scientific method, ecology, evolution, biodiversity, and sustainability.

BIOL 390 Natural History Field Study .5-4 Units*Course Transferable to CSU**Hours: 3-24 hours LEC; 18-144 hours LAB*

This course focuses on the ecology and natural history of specific habitats of biological interest. Course content varies according to field destination but may include topics in botany, zoology, marine, conservation, and geography. Field study methodology and tools are also covered. Field trips are required and field trip expense fees may be required.

BIOL 400 Principles of Biology 5 Units*Prerequisite: CHEM 400 with a grade of "C" or better**Advisory: Eligible for ENGRD 310 or ENGRD 312 AND ENGWR 300; OR ESLR 340 AND ESLW 340.**General Education: AA/AS Area IV; CSU Area B2; CSU Area B3;**IGETC Area 5B; IGETC Area 5C**Course Transferable to UC/CSU**Hours: 54 hours LEC; 108 hours LAB*

This course introduces biological concepts important for a general understanding and background for biology majors and pre-professional programs. Emphasis is on the scientific method and basic processes common to all forms of life. Topics include cell structure and function, cell physiology, cell reproduction, Mendelian and molecular genetics, evolution, and ecology. (C-ID BIOL 190)

BIOL 410 Principles of Botany 5 Units*Prerequisite: BIOL 400 with a grade of "C" or better**Advisory: Eligible for ENGRD 310 or ENGRD 312 AND ENGWR 300; OR ESLR 340 AND ESLW 340.**General Education: CSU Area B2; CSU Area B3; IGETC Area 5B;**IGETC Area 5C**Course Transferable to UC/CSU**Hours: 54 hours LEC; 108 hours LAB*

This course covers the general principles of botany for science majors. It builds upon and applies concepts developed in cell and molecular biology to the study of plants. It covers the anatomy and physiology, morphology, ecology, diversity, and evolution of higher plants. Thorough cladistic analysis is used to study phylogenetic relationships among the cyanobacteria, protists, fungi, and all major plant phyla. It also covers general ecological principles. Field trips may be required. (C-ID BIOL 155; Part of C-ID BIOL 130S)

BIOL 415 Introduction to Biology: Biodiversity, Evolution, and Ecology 5 Units*Prerequisite: BIOL 400 with a grade of "C" or better**Advisory: Eligible for ENGRD 310 or ENGRD 312 AND ENGWR 300; OR ESLR 340 AND ESLW 340**General Education: CSU Area B2; CSU Area B3; IGETC Area 5B;**IGETC Area 5C**Course Transferable to UC/CSU**Hours: 54 hours LEC; 108 hours LAB*

This course, intended for science majors, introduces the ecological and evolutionary processes that shape biodiversity, relating the patterns of biodiversity to small and large scale environmental effects. The diversity of life on Earth (including animals, plants, fungi, protists, and additional unicellular organisms) is covered. Overarching themes include evolutionary mechanisms, phylogenetic analysis, interactions of organisms with the environment, and global processes and patterns. Not open for credit to students who have completed BIOL 410 and BIOL 420 with a grade of C or better. Field trips may be required. (C-ID BIOL 140)

BIOL 420 Principles of Zoology 5 Units*Prerequisite: BIOL 400 with a grade of "C" or better**General Education: CSU Area B2; CSU Area B3; IGETC Area 5B;**IGETC Area 5C**Course Transferable to UC/CSU**Hours: 54 hours LEC; 108 hours LAB*

This course covers general principles of zoology. Topics covered include a survey of the animal kingdom, embryology, evolution, systematics, ecology, and comparative anatomy and physiology. Field trips may be required. (C-ID BIOL 150; Part of C-ID BIOL 130S)

BIOL 430 Anatomy and Physiology 5 Units*Prerequisite: CHEM 305, 309, or 400 with a grade of "C" or better;**AND ENGWR 101 or ESLW 320 with a grade of "C" or better, or**placement into transfer-level English through the assessment process.**Advisory: Eligible for ENGRD 310 or ENGRD 312; OR ESLR 340**General Education: AA/AS Area IV; CSU Area B2; CSU Area B3;**IGETC Area 5B; IGETC Area 5C**Course Transferable to UC/CSU**Hours: 54 hours LEC; 108 hours LAB*

This lecture and laboratory course in human anatomy and physiology emphasizes the integration of structure and function. The underlying basis of the course is built on the study of anatomical terminology, cells, and tissues. The course expands this study into the integumentary, skeletal, muscular, and nervous systems. Laboratory study is enhanced by the microscopic study of tissues, examination of anatomical models, and the dissection of preserved material. Laboratory study is also enhanced by the examination of prosected whole cadavers as well as prosected head, torso, upper and lower extremities, and individual organs. Laboratory activities also include both wet-lab experiments and computer simulations. Both BIOL 430 and BIOL 431 must be taken to complete the study of all major body systems. (Part of C-ID BIOL 115S)

BIOL 431 Anatomy and Physiology 5 Units*Prerequisite: BIOL 430 with a grade of "C" or better**Advisory: Eligible for ENGRD 310 or ENGRD 312; OR ESLR 340**General Education: AA/AS Area IV**Course Transferable to UC/CSU**Hours: 54 hours LEC; 108 hours LAB*

This lecture and laboratory course in human anatomy and physiology emphasizes the integration of structure and function. It provides students with an understanding of the structure, function, and regulation of the human body through the physiological integration of the following systems: cardiovascular, lymphatic, respiratory, digestive, urinary, endocrine, and reproductive. Laboratory study is enhanced by the microscopic study of tissues, examination of anatomical models, and the dissection of preserved material. Laboratory activity is also enhanced by the examination of whole cadavers as well as prosected head, torso, upper and lower extremities, and individual organs. Laboratory activities also include both wet-lab experiments and computer simulations. Both BIOL 430 and BIOL 431 must be taken to complete the study of all major body systems. (Part of C-ID BIOL 115S)

BIOL 440 General Microbiology 4 Units

Prerequisite: CHEM 305, 309, or 400 with a grade of "C" or better
Advisory: Eligible for ENGRD 310 or ENGRD 312 AND ENGWR 300; OR ESLR 340 AND ESLW 340; AND BIOL 300 or CHEM 306 with a grade of "C" or better.

General Education: CSU Area B2; CSU Area B3; IGETC Area 5B; IGETC Area 5C

Course Transferable to UC/CSU
Hours: 54 hours LEC; 72 hours LAB

This course introduces microorganisms and their effects on human health. It 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.

BIOL 442 General Microbiology and Public Health 5 Units

Prerequisite: CHEM 306, CHEM 309, or CHEM 400 with a grade of "C" or better; OR CHEM 305 with a grade of "C" or better and one of the following: BIOL 300, BIOL 303, or BIOL 310 with a grade of "C" or better

Advisory: Eligible for ENGRD 310 or ENGRD 312 AND ENGWR 300; OR ESLR 340 AND ESLW 340 with a grade of "C" or better.
General Education: CSU Area B2; CSU Area B3; IGETC Area 5B; IGETC Area 5C

Course Transferable to UC/CSU
Hours: 54 hours LEC; 108 hours LAB

This course provides a survey of bacteria, viruses, fungi, protozoa, and helminths that are associated with human infectious diseases and public health. It examines their cellular and molecular structure, physiology, metabolism, and genetics. Laboratory work introduces methods for cultivating and characterizing microorganisms.

BIOL 482 Honors Marine Biology 4 Units

Prerequisite: Placement into ENGWR 480 through the assessment process.

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

Course Transferable to UC/CSU
Hours: 54 hours LEC; 54 hours LAB

This course is an honors level introduction to marine biology. Using a seminar style, it explores physical oceanography, marine algae, marine vertebrate and invertebrate animals, and the ecology of various marine zones. Field trips focusing on inter-tidal organisms of the Central and Northern California Coast are required. A portion of this course may be offered in a TBA component of 54 hours which may include but is not limited to designing and conducting experiments in the rocky intertidal, invertebrate identification, salt marsh ecology, sandy beach ecology, estuary ecology, or comparative anatomy of fishes. The course is not open to students who have completed BIOL 370.

BIOL 490 Science Skills and Applications .5 Units

Corequisite: Current enrollment in a science, nutrition or nursing 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 and in the nursing program. A partial list of skills may include the following: textbook comprehension, principles of learning and retention, note taking, annotating, discipline-based vocabulary, paraphrasing, reading graphics, test taking, and problem solving. This course is offered in a flexible TBA format of 27 laboratory hours in order to accommodate the student's schedule. Registration is open through the tenth week of the semester. Pass/No Pass only.

BIOL 495 Independent Studies in Biology 1-3 Units

Course Transferable to CSU
Hours: 54-162 hours LAB

Independent Study is an opportunity for the student to extend classroom experience in this subject, while working independently of a formal classroom situation. Independent study is an extension of work offered in a specific class in the college catalog. To be eligible for independent study, students must have completed the basic regular catalog course at American River College. They must also discuss the study with a professor in this subject and secure approval. Only one independent study for each catalog course will be allowed.

Biotechnology**BIOT 301 Biotechnology and Human Health 3 Units**

Prerequisite: BIOL 303, BIOL 310, BIOL 400, BIOL 440, BIOL 442, or BIOT 307 with a grade of "C" or better

Course Transferable to CSU
Hours: 54 hours LEC

This course introduces biotechnology as it pertains to human health and disease. Topics include an introduction to molecular biology and genetics, recombinant DNA technology, biopharmaceutical products, forensics and genetic testing, stem cells and regenerative medicine, genomics and bioinformatics, and ethical issues arising from biotechnology disease diagnosis and treatment.

BIOT 305 Introduction to Bioinformatics 1 Unit

Prerequisite: BIOL 303, BIOL 310, BIOL 400, BIOL 440, BIOL 442, BIOT 301, or BIOT 307 with a grade of "C" or better

Course Transferable to CSU
Hours: 14 hours LEC; 14 hours LAB

This course examines the basic concepts and techniques in bioinformatics, the computer analysis of nucleic acids and proteins. Topics include biotechnology databases, database searching, structure and function analysis of biological molecules, sequence alignment and analysis, and biological applications of bioinformatics.

BIOT 307 Biotechnology and Society 2 Units

Course Transferable to UC/CSU
Hours: 36 hours LEC

This course examines the scientific and social impact of biotechnology by introducing basic technical concepts to examine recent advances. Topics include biotechnology applications in medicine, agriculture, industry, and the environment, and their ethical implications and public perception.

BIOT 311 Biotechnology Laboratory Methods - Molecular Techniques 2 Units

Prerequisite: BIOL 300, BIOL 303, BIOL 310, BIOL 400, BIOL 440, BIOL 442, or BIOT 307 with a grade of "C" or better

Course Transferable to CSU
Hours: 18 hours LEC; 54 hours LAB

This course covers basic concepts and techniques to work effectively in a bioscience laboratory. Topics include laboratory solution preparation, recombinant DNA methods and nucleic acid analysis techniques, protein separation and analytical techniques, good laboratory practice, and product quality issues.

**BIOT 312 Biotechnology Laboratory Methods -
Microbial and Cell
Culture Techniques 2 Units**

*Prerequisite: BIOL 300, BIOL 303, BIOL 310, BIOL 400,
BIOL 440, BIOL 442, or BIOT 307 with a grade of "C" or better
Course Transferable to CSU*

Hours: 18 hours LEC; 54 hours LAB

This course covers basic concepts and techniques to work effectively in a bioscience laboratory. Topics include media preparation, microbial and plant cell culture techniques, biosafety guidelines, and DNA and enzyme diagnostic techniques.

BIOT 498 Work Experience in Biotechnology 1-4 Units

*Advisory: Eligible for ENGRD 310 or ENGRD 312
AND ENGRW 300; OR ESLR 340 AND ESLW 340.*

Enrollment Limitation: Students must be in a paid or unpaid internship, volunteer position, or job related to biotechnology with a cooperating site supervisor. Students are advised to consult with the Biotechnology Department faculty to review specific certificate and degree work experience requirements.

General Education: AA/AS Area III(b)

Course Transferable to CSU

Hours: 60-300 hours LAB

This course provides students with opportunities to develop marketable skills in preparation for employment or advancement within the field of biotechnology. It is designed for students interested in work experience and/or internships in transfer-level degree occupational programs. Course content includes understanding the application of education to the workforce, completion of Title 5 required forms which document the student's progress and hours spent at the work site, and developing workplace skills and competencies. During the semester, the student is required to complete 75 hours of related paid work experience, or 60 hours of related unpaid work experience for one unit. An additional 75 or 60 hours of related work experience is required for each additional unit. All students are required to attend the first class meeting, a mid-semester meeting, and a final meeting. Additionally, students who have not already successfully completed a Work Experience course will be required to attend weekly orientations while returning participants may meet individually with the instructor as needed. Students may take up to 16 units total across all Work Experience course offerings. This course may be taken up to four times when there are new or expanded learning objectives. Only one Work Experience course may be taken per semester.