

Area: Science and Engineering
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Degree: A.S. - Biotechnology
 Certificate: Biotechnology

Biotechnology Degree

This program 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 program also prepares the student for transfer at the upper division level to academic programs involving biotechnology.

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.

Requirements for Degree		41-42 Units
BIOL 310	General Biology (4)	4 - 5
or BIOL 400	Principles of Biology (5)	
BIOL 440	General Microbiology	4
BIOT 300	Introduction to Biotechnology	4
BIOT 307	Biotechnology and Society	2
BIOT 315	Methods in Biotechnology	5
CHEM 305	Introduction to Chemistry (5)	5
or CHEM 400	General Chemistry (5)	
CHEM 306	Introduction to Chemistry (5)	5
or CHEM 401	General Chemistry (5)	
CISC 300	Computer Familiarization	1
ENGWR 300	College Composition	3
ENGWR 301	College Composition and Literature (3)	3
or ENGWR 302	Advanced Composition and Critical Thinking (3)	
or ENGWR 342	Introduction to Technical/Professional Communication (3)	
STAT 301	Introduction to Probability and Statistics 3	2
<i>And a minimum of 2 units from the following:</i>		
BIOT 498	Work Experience in Biotechnology (1 - 4)	2
and BIOT 305	Introduction to Bioinformatics (1)	
or BIOT 310	Polymerase Chain Reaction (PCR) Methods (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

This program 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 program is suitable for preparing the student for the biotechnology workplace at the support personnel level.

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.

Requirements for Certificate		32-33 Units
BIOL 310	General Biology (4)	4 - 5
or BIOL 400	Principles of Biology (5)	
BIOL 440	General Microbiology	4
BIOT 300	Introduction to Biotechnology	4
BIOT 315	Methods in Biotechnology	5
CHEM 305	Introduction to Chemistry (5)	5
or CHEM 400	General Chemistry (5)	
CISC 300	Computer Familiarization	1
ENGWR 300	College Composition	3
MATH 120	Intermediate Algebra	5
<i>And a minimum of 1 unit from the following:</i>		
BIOT 305	Introduction to Bioinformatics (1)	
BIOT 307	Biotechnology and Society (2)	
BIOT 310	Polymerase Chain Reaction (PCR) Methods (1)	
BIOT 498	Work Experience in Biotechnology (1 - 4)	

BIOL 102 Introduction to Concepts 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. 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.

BIOL 115 Basic Anatomy and Physiology 3 Units

General Education: AA/AS Area IV

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 assistants, medical secretaries, medical transcriptionists, and hazardous materials technicians. BIOL 115 and 116 compose a complete study of the basic anatomy and physiology of the human body.

BIOL 116 Basic Anatomy and Physiology 3 Units

General Education: AA/AS Area IV

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

BIOL 117 Basic Anatomy and Physiology Lab 1 Unit

Corequisite: BIOL 115.

Hours: 54 hours LAB

This introductory laboratory course in basic human anatomy and physiology is designed to complement the lecture course BIOL 115. This course is designed for medical assistants, medical secretaries, medical transcriptionists, and hazardous materials technicians. This course is not acceptable in registered nursing and respiratory care programs.

BIOL 118 Basic Anatomy and Physiology Laboratory 1 Unit

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

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 covers basic biological principles and how they relate to humans. Concepts include an introduction to the philosophy of science. Basic cell chemistry, structure, and physiology are covered. 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. This course is not open to students who have completed BIOL 310.

BIOL 303 Survey of Biology 4 Units

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

Course Transferable to UC/CSU

Hours: 54 hours LEC; 54 hours LAB

This course covers biological principles with emphasis on a survey of the major groups of organisms and a comparison of the structure and function of their cells, tissues, and organ systems. Ecology, genetics, and evolution are included. Plant and animal dissection are included as part of the laboratory activities. This course is appropriate for liberal studies, elementary education, environmental studies, recreation and other related majors. Field trips are required.

BIOL 305 Natural History 4 Units

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 covers basic ecological and biological principles in order to understand the origin and diversity of living organisms. Topics

range from landscape formation, 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.

BIOL 310 General Biology 4 Units

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 non-science 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. This course is not open to students who have completed BIOL 300.

BIOL 320 Field Botany 3 Units

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

General Education: AA/AS Area VI

Course Transferable to CSU

Hours: 36 hours LEC; 54 hours LAB

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. Sight recognition and plant use will be emphasized. An analysis of ethnicity and ethnocentrism is included.

BIOL 330 Natural History of Insects 3 Units

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

Course Transferable to CSU

Hours: 18 hours LEC; 54 hours LAB

This introductory course covers the biologically unique aspects of bird life. Topics include avian flight, migration, song, feeding and foraging ecology, reproduction and mating systems, social behavior, and conservation. Laboratory work explores bird structure and function, and is supplemented by required field trips where field skills are learned. Identification of avian family traits and common local species is accomplished by means of taxonomy and field study.

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

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, 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 350 Environmental 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 provides a broad overview of the natural environment using fundamental biological and ecological principles. Major topics include the cultural history of environmentalism, the role of science in investigating environmental impacts, ecosystem structure and function, and the concept of biodiversity. Human impacts on the plant and animals of forest, grassland, river, desert, tropical, marine and polar systems are covered with a specific focus on California landscapes and global biodiversity hotspots. This course provides the scientific background to analyze major global and regional environmental problems and to discuss the scientific techniques used to solve them. Field trips are required.

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 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 extinctions, biodiversity, ecosystem functions, and the interdependence between humans and our environment. This course places emphasis on scientific processes and methodology. Statewide and local environments will be highlighted. Field trips and a semester project may be required.

BIOL 370 Introduction to Marine Environment 4 Units

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 oceanography and marine biology. It includes the study of sea water, 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.

BIOL 390 Natural History Field Study .5-4 Units

Course Transferable to 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

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

Advisory: ENGWR 102 or 103, and ENGRD 116 with a grade of "C" or better; OR ESLR 320 and ESLW 320 with a grade of "C" or better; OR placement through assessment process.

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 an introductory course covering biological concepts important for a general understanding and background for biology majors and pre-professional students. 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.

BIOL 410 Principles of Botany 5 Units

Prerequisite: BIOL 400 with a grade of "C" or better

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

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 a plant kingdom survey. All laboratory work includes instructor directed lecture-discussions consisting of an introduction and analysis of the data and idea covered. One field trip is required.

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

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, genetics, systematics, and comparative anatomy and physiology. One or two field trips per semester are required.

BIOL 430 Anatomy and Physiology 5 Units

Prerequisite: CHEM 305, 309, or 400 with a grade of "C" or better

General Education: AA/AS Area IV

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. The topics covered are anatomical terminology, chemistry, cells, histology, articulations, and the integumentary, skeletal, muscular and nervous systems. Both BIOL 430 and BIOL 431 must be taken to study all of the major body systems.

BIOL 431 Anatomy and Physiology 5 Units

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

General Education: AA/AS Area IV

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.

BIOL 440 General Microbiology 4 Units

Prerequisite: CHEM 305, 309, 310, or 400 with a grade of "C" or better

General Education: CSU Area B2; CSU Area B3; IGETC Area 5B
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 Bacteriology 5 Units

Prerequisite: CHEM 305, 310, or 400 with a grade of "C" or better

General Education: CSU Area B2; CSU Area B3; IGETC Area 5B
Course Transferable to UC/CSU

Hours: 54 hours LEC; 108 hours LAB

This course provides a survey of bacteria and viruses, examining their cellular and molecular structure, physiology, metabolism, and genetics. Laboratory work introduces methods for cultivating and characterizing microorganisms and explores the properties of microorganisms in various habitats.

BIOL 460 Biology of Cancer 3 Units

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

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

Same As: CHEM 482

Prerequisite: Cumulative GPA of 3.0 or above; CHEM 400 and BIOL 400 with a grade of "C" or better; ENGWR 300 or 480 with a grade of "C" or better.

Course Transferable to CSU

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 two times for credit.

BIOL 482 Honors Introduction to Marine Environment 4 Units

Prerequisite: Cumulative GPA of 3.0 or above; ENGWR 300 or 480 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; 54 hours LAB

This course is an honors level introduction to oceanography and marine biology. Using a seminar style, it explores sea water, marine

geology, marine algae, marine vertebrate and invertebrate animals, and the ecology of various marine zones. Field trips focusing on inter-tidal organisms of the Central California Coast are required. 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 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. Registration is open through the twelfth week of the semester. This course may be taken four times. Credit/No Credit only.

Biotechnology**BIOT 300 Introduction to Biotechnology 4 Units**

Prerequisite: BIOL 310 or 400, CHEM 305 with a grade of "C" or better.

Course Transferable to UC/CSU

Hours: 54 hours LEC; 54 hours LAB

This course provides the necessary biochemistry, genetics and molecular biology principles that constitute the foundation for training in the field of biotechnology. Topics covered will include recombinant DNA technology; DNA production, characterization and analysis; PCR methodologies. Emphasis in lab and theory skills.

BIOT 305 Introduction to Bioinformatics 1 Unit

Prerequisite: BIOL 310 or 400 with a grade of "C" or better.

Advisory: BIOT 300 and CISC 305.

Course Transferable to CSU

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

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

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**

Prerequisite: BIOT 300 with a grade of "C" or better.

Course Transferable to CSU

Hours: 14 hours LEC; 14 hours LAB

This course provides training in techniques involving the polymerase chain reactions (PCR). Topics include PCR protocols, troubleshooting, and applications to medicine, forensics, and agriculture.

BIOT 315 Methods in Biotechnology**5 Units**

Prerequisite: BIOT 300 with a grade of "C" or better.

Course Transferable to 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: BIOT 300 with a grade of "C" or better.

Course Transferable to CSU

Hours: 9 hours LEC; 27-60 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.