

# Biology

Science, Mathematics & Engineering

**Dean**  
Robert Montañez  
**Phone**  
(916) 691-7204  
**Area Office**  
LRC 121

**Counseling**  
(916) 691-7316  
**Cooperative Work Experience**  
(916) 691-7372

## DEGREE

A. S. — Biology: Biological Sciences

### Program Description

CRC's Biology program offers courses which satisfy general education requirements in Life Sciences, are prerequisites for a degree in Veterinary Technology, Medical Assisting, and Health Information Technology, and prepare students for transfer opportunities to four-year programs in biological sciences, nursing, physical therapy, and programs leading to careers in teaching, medicine, dentistry and veterinary medicine among others.

Students planning to continue for a four-year degree should consult the lower division requirements of the transfer program of the university to which they plan to attend.

### Career Opportunities

Nursing	Physician's Assistant
Physical Therapy	Teaching; Microbiology
Wildlife Biology	Marine Biology
Pharmacy	Medicine
Dentistry	Veterinary Medicine
Optometry	Research
Nutrition	

*Some Career Opportunities require more than two years of college study. Classes beyond the associate degree may be required for some Career Opportunities or to fully prepare students for transfer to a university program.*

### Highlights

- Extensive laboratory experience
- Day and evening sections of pre-nursing classes
- Field trips
- A friendly faculty who have studied biology in South America, the Galapagos Islands, Africa and North America
- A Mathematics, Engineering and Science Achievement (MESA) program
- Field studies classes

### NOTE TO TRANSFER STUDENTS:

If you are interested in transferring to a four-year college or university to pursue a bachelor's degree in this major, it is critical that you meet with a CRC counselor to select and plan the courses for your major. Schools vary widely in terms of the required preparation. The courses that CRC requires for an associate's degree in this major may be different from the requirements needed for the bachelor's degree.

**For information about the student learning outcomes for this program, see <http://www.crc.losrios.edu/pslo>**

## Field Study Classes at Cosumnes River College

*Nature is often the best classroom! Come learn outside in Cosumnes River College's field study courses. These classes consist of short classroom sessions followed by extended trips to some of the most unique and beautiful environments in California, including Big Sur, Monterey Bay, Mt. Lassen, Point Reyes, Yosemite and more! These short-term classes are offered by several departments, including Biology, Geography, Geology, Photography, and Physical Education. For more information about specific classes, consult the class schedule or contact each department.*



## DEGREE

A.S. - Biology: Biological Sciences

CODE #1451

**REQUIRED PROGRAM.....Units**

### **BIOLOGY CONCENTRATION OPTION**

BIOL 400	Principles of Biology .....	5
BIOL 410	Principles of Botany .....	5
BIOL 420	Principles of Zoology .....	5
CHEM 400	General Chemistry .....	5
CHEM 401	General Chemistry .....	5
MATH 350	Calculus for the Life and Social Sciences I (3) .....	6-10
	<b>and</b> MATH 351 Calculus for the Life and Social Sciences II (3)	
	<b>or</b> MATH 400 Calculus I (5)	
	<b>and</b> MATH 401 Calculus II (5)	
PHYS 350	General Physics (4) .....	8-12
	<b>and</b> PHYS 360 General Physics (4)	
	<b>or</b> PHYS 370 Introductory Physics - Mechanics and Thermodynamics (5)	
	<b>and</b> PHYS 380 Introductory Physics - Electricity and Magnetism, Light and Modern Physics (5)	
	<b>or</b> PHYS 411 Mechanics of Solids and Fluids (4)	
	<b>and</b> PHYS 421 Electricity and Magnetism (4)	
	<b>and</b> PHYS 431 Heat, Waves, Light and Modern Physics (4)	

**TOTAL UNITS REQUIRED ..... 39-47**

G.E. Graduation Requirements for this degree - see pages 20-21

**DEGREE**

A.S. Biology: Biological Sciences

**HEALTH SCIENCE /****PRE-PROFESSIONAL OPTION****REQUIRED PROGRAM.....Units**

BIOL 400 Principles of Biology .....	5
BIOL 410 Principles of Botany .....	5
BIOL 420 Principles of Zoology .....	5
CHEM 400 General Chemistry .....	5
CHEM 401 General Chemistry .....	5
CHEM 420 Organic Chemistry .....	5
CHEM 421 Organic Chemistry .....	5
MATH 350 Calculus for the Life and Social Sciences I (3).....	6-10
<b>and</b> MATH 351 Calculus for the Life and Social Sciences II (3)	
<b>or</b> MATH 400 Calculus I (5)	
<b>and</b> MATH 401 Calculus II (5)	
PHYS 350 General Physics (4) .....	8-12
<b>and</b> PHYS 360 General Physics (4)	
<b>or</b> PHYS 370 Introductory Physics - Mechanics and Thermodynamics (5)	
<b>and</b> PHYS 380 Introductory Physics - Electricity and Magnetism, Light and Modern Physics (5)	
<b>or</b> PHYS 411 Mechanics of Solids and Fluids (4)	
<b>and</b> PHYS 421 Electricity and Magnetism (4)	
<b>and</b> PHYS 431 Heat, Waves, Light and Modern Physics (4)	
<b>TOTAL UNITS REQUIRED .....</b>	<b>49-57</b>

**PRE-NURSING OPTION \*****REQUIRED PROGRAM.....Units**

BIOL 440 General Microbiology .....	4
BIOL 430 Anatomy and Physiology .....	5
BIOL 431 Anatomy and Physiology .....	5
CHEM 305/307 Introduction to Chemistry .....	4-5
CHEM 306/308 Introduction to Chemistry .....	4-5
NUTRI 300 Nutrition.....	3
FCS 324 Human Development: A Life Span.....	3
PSYC 300 General Principles (3) or	
PSYC 320 Social Psychology (3).....	3
<b>TOTAL UNITS REQUIRED .....</b>	<b>31-33</b>

*\*NOTE: This degree is designed for students intending to transfer to a nursing program at a 4-year college or university. It does not prepare the student for immediate employment as a nurse. Students earning a nursing degree will need to complete several lower division nursing classes after transferring.*

*Associate of Science degree (A.S.) may be obtained by completion of the Required Program, plus General Education requirements, plus sufficient electives to meet a 60-unit total.*

**TOTAL UNITS REQUIRED.....31-57**  
(depending on option selected)

**G.E. Graduation Requirements for this degree - see pages 20-21**

**Note:**

*A locker deposit is required to participate in most biology courses. The deposit is payable at the Business Office prior to the third class meeting. This fee is refundable at the end of the semester.*

**BIOLOGY (BIOL)****BIOL 100****Introduction to Concepts of Human Anatomy and Physiology****3 Units***Prerequisite: None**Hours: 54 hours LEC*

This introductory course provides an overview of the basic anatomy and physiology of all body systems. It is designed as a non-transferable course for the Health Information Technology Program, and may be useful for other health-related technologies and for strengthening or developing a vocabulary in human anatomy and physiology.

**BIOL 102****Essentials of Human Anatomy and Physiology****4 Units***Prerequisite: None**General Education: AA/AS Area IV**Hours: 54 hours LEC ; 54 hours LAB*

This introductory course provides an overview of the basic anatomy and physiology of all body systems. It is designed as a non-transferable course and meets the minimum requirements for Medical Assisting, Health Information Technology, Dietetic Technician, Licensed Vocational Nursing, and other health-related technologies. It is also useful for strengthening or developing a vocabulary in human anatomy and physiology.

**BIOL 295****Independent Studies in Biology****1-3 Units***Prerequisite: None**Hours: 18 hours LEC ; 54 hours LAB***BIOL 299****Experimental Offering in Biology****.5-4 Units***Prerequisite: None**Hours: 18 hours LEC ; 54 hours LAB***BIOL 300****The Foundations of Biology****3 Units***Prerequisite: None**Advisory: ENGRD 312 and ENGWR 101; or equivalent skills demonstrated through the assessment process**General Education: AA/AS Area IV; CSU Area B2; IGETC Area 5B**Course Transferable to UC/CSU**See UC Limitations & Counselor**Hours: 54 hours LEC*

This course is a survey of major topics in the biological sciences for the non-science major with an emphasis on human biology. Units covered include the origin of life, cell structure and chemistry, metabolism, Mendelian and molecular genetics, genetic engineering, evolution, anatomy and physiology of humans, animal behavior and ecology.

**BIOL 307**

**Biology of Organisms**

**4 Units**

*Prerequisite: None*

*Advisory: ENGRD 312 and ENGWR 101; or equivalent skills demonstrated through the assessment process*

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

*Course Transferable to UC/CSU*

*See UC Limitations & Counselor*

*Hours: 54 hours LEC ; 54 hours LAB*

This is a general biology course focusing on a survey of the plant and animal kingdoms. The course covers the general principles of biology including: methods of science, cell organization, genetics, evolution, ecology, biodiversity, and anatomy. These principles are explored in more depth through the examination of additional topics which may include: disease and epidemiology, physiological ecology, animal behavior, biotechnology, population growth and regulation, ecosystem ecology, and conservation biology. Evolution and biodiversity are continuing themes running throughout the course and are included in each major topic. The course is designed for non-science majors and is especially useful for liberal studies, elementary education, environmental studies, recreation, and similar majors.

**BIOL 310**

**General Biology**

**4 Units**

*Prerequisite: None*

*Advisory: ENGRD 312 and ENGWR 101; or equivalent skills demonstrated through the assessment process*

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

*Course Transferable to UC/CSU*

*See UC Limitations & Counselor*

*Hours: 54 hours LEC ; 54 hours LAB*

This is a survey of biological science with an emphasis on human biology. Topics covered include scientific inquiry, cell structure, transmission and molecular genetics, major organ systems, evolution, and ecology. Major biological principles are explored in each topic, but an emphasis is placed on human issues. The laboratory activities are designed to further investigate and illuminate each topic area. This course is intended for non-science majors.

**BIOL 342**

**The New Plagues: New and Ancient Infectious Diseases Threatening World Health**

**3 Units**

*Prerequisite: None*

*Advisory: ENGRD 312 and ENGWR 101; or equivalent skills demonstrated through the assessment process*

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

*Course Transferable to UC/CSU*

*Hours: 54 hours LEC*

This course will cover general biological concepts and the 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**

*Same As: ENVT 304*

*Prerequisite: None*

*Advisory: ENGRD 312 and ENGWR 101; or equivalent skills demonstrated through the assessment process.*

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

*Course Transferable to UC/CSU*

*Hours: 54 hours LEC*

This course provides an overview of ecosystems and natural resources. Major topics covered include ecological principles, ecosystem functioning, conservation biology, resource use and management, pollution and other human-caused environmental impacts. This course provides the background needed to understand major global and regional issues such as acid rain, global warming, hazardous waste disposal, deforestation and endangered species recovery. This course is especially useful for Environmental Science, Ecology, Recreation, and Political Science majors. Field trips which may require a nominal fee, attendance at public meetings and/or a semester project may be required.

**BIOL 351**

**Global Climate Change**

**3 Units**

*Same As: GEOG 305*

*Prerequisite: None*

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

*Course Transferable to CSU*

*Hours: 54 hours LEC*

This interdisciplinary course explores the natural and human factors causing the Earth's climate to change. Whether alarmed, skeptical, or just curious about climate change, this course will provide the scientific tools to analyze the evidence that climate change is a looming threat. Through lectures, readings, discussions and projects, students will examine the Earth's present and past climates as well as the influence of climate on the geographical distribution of plants, animals and human societies. This course is the same as GEOG 305, and only one may be taken for credit. See "Cross-Listed Courses" in the catalog.

**BIOL 352**

**Conservation Biology**

**3 Units**

*Prerequisite: None*

*General Education: AA/AS GE Area IV*

*Course Transferable to 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, basic principles of ecology, genetics and evolution, patterns of biodiversity and extinction, and the interdependence between humans and our environment. This course places emphasis on scientific processes and methodology and the application of science to conservation issues. Field trips and/or a semester project may be required.

**BIOL 366****Introduction to Toxicology:****The Biology and Chemistry of Poisons****3 Units***Prerequisite: None**Advisory: ENGRD 312 and ENGWR 101 or equivalent skills**demonstrated through the assessment process**General Education: AA/AS Area IV; CSU Area B2; IGETC Area 5B**Course Transferable to UC/CSU**Hours: 54 hours LEC*

This course provides an overview of the biology of natural and man-made toxic substances. It will provide an introduction to physiological and environmental processes and will cover a breadth of biological principles, from cell biochemistry to ecology. The course will employ case studies to analyze how the scientific method is used to discover how toxic substances affect individuals, populations, and ecosystems.

**BIOL 390****Natural History Field Study****.5-4 Units***Prerequisite: None**Course Transferable to CSU**Hours: 6 hours LEC ; 36 hours LAB*

This course will study the ecology and natural history covered in the field. Animals, plants and geology will be studied and their interrelationships investigated. The course(s) will be offered in the appropriate area (mountains, desert or seashore and ocean). Assignments, field notes and appropriate exams/quizzes will be an integral part of the course. Students will be responsible for providing their own lodging or camping equipment and meals. Campsites will be available. This course is ideal for future teachers, parents, resource management majors and those interested in the biological sciences.

**BIOL 400****Principles of Biology****5 Units***Prerequisite: [Chem 400 OR Chem 305 OR Chem 307] AND**Intermediate Algebra (Math 120 or Math 125 or equivalent skills demonstrated through the assessment process)**General Education: AA/AS Area IV; CSU Area B2; CSU Area B3; IGETC Area 5B**Course Transferable to UC/CSU**See UC Limitations & Counselor**Hours: 54 hours LEC ; 108 hours LAB*

This course introduces universal biological principles, including biological molecules, enzymes, cell structure and function, biochemistry, Mendelian and molecular genetics, ecology and evolution. BIOL 400 is recommended for science majors and students in pre-professional programs.

**BIOL 401****Principles of Biology for Veterinary Technicians****5 Units***Prerequisite: CHEM 305 or 307 with a grade of "C" or better**General Education: AA/AS Area IV**Course Transferable to CSU**Hours: 54 hours LEC ; 108 hours LAB*

This course introduces universal biological principles, including biological molecules, enzymes, cell structure and function, biochemistry, Mendelian and molecular genetics, ecology and evolution. Applications and examples are chosen to reflect the needs of Veterinary Technology students. Science majors and students in pre-professional programs who are planning on transferring should not take this course; they should enroll in BIOL 400.

**BIOL 410****Principles of Botany****5 Units***Prerequisite: BIOL 400 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 introduces the biology of plants, fungi, cyanobacteria, and algae. Topics covered include the anatomy and physiology, development, classification, evolution and ecology of botanical organisms. Some labs involve local field trips; a weekend field trip may be required (an alternative assignment will be available).

**BIOL 420****Principles of Zoology****5 Units***Prerequisite: BIOL 400 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**See UC Limitations & Counselor**Hours: 54 hours LEC ; 108 hours LAB*

This course is an introduction to zoology with particular emphasis on comparative anatomy and physiology of vertebrates and invertebrates. The basic principles of evolution, taxonomy, embryology, morphology, physiology, behavior and ecology will be covered.

**BIOL 430****Anatomy and Physiology****5 Units***Prerequisite: CHEM 305, 307, or 400 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**See UC Limitations & Counselor**Hours: 54 hours LEC ; 108 hours LAB*

This is an introductory course in which the basic principles of human anatomy and physiology are presented in an integrated fashion. This course covers anatomical terminology, basic organic chemistry, histology, 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: CSU Area B2; CSU Area B3; IGETC Area 5B**Course Transferable to UC/CSU**See UC Limitations & Counselor**Hours: 54 hours LEC ; 108 hours LAB*

This is an introductory course in which the basic principles of human anatomy and physiology are presented in an integrated fashion. This course covers the circulatory, respiratory, digestive, urinary, endocrine and reproductive systems. Both BIOL 430 and BIOL 431 must be taken to study all of the major body systems.

**BIOL 440**

**General Microbiology 4 Units**

*Prerequisite:* CHEM 305 or 307 or 400 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

This course introduces the concepts of microbiology with an emphasis on forms, modes of growth, cell specialization, mutual, commensal and parasitic relationships of bacteria, fungi, molds, protozoans and viruses. Topics will be correlated with medical and health applications to animals and human beings.

**BIOL 462**

**Genetics in Contemporary Human Society 3 Units**

*Prerequisite:* None  
*General Education:* AA/AS Area IV; CSU Area B2; IGETC Area 5B  
*Course Transferable to UC/CSU*  
*See UC Limitations & Counselor*  
*Hours:* 54 hours LEC

This course introduces students to the principles of modern genetics, especially as they apply to human health and society. Rapid advances in scientists’ knowledge of what genes are and how they work impact the daily life of people through genetically modified foods, DNA fingerprinting, therapies for human disease and a variety of reproductive technologies. This course includes the study of Mendelian inheritance, the roles of chromosomes and genes in human disease, how genes direct development, the relationship between genes, environment and behavior, and the contribution of genes to human diversity. Ethical, legal and social issues will be explored through class discussions and written reports. This course is primarily intended for non-biology majors; however, biology majors may enjoy the opportunity to explore human genetics in greater depth than is possible in BIOL 400.

**BIOL 470**

**Behavioral Biology 3 Units**

*Prerequisite:* None  
*Advisory:* ENGRD 312 and ENGWR 101 or equivalent skills demonstrated through the assessment process  
*General Education:* AA/AS Area IV; CSU Area B2; IGETC Area 5B  
*Course Transferable to UC/CSU*  
*Hours:* 54 hours LEC

This course provides an overview of animal and human behavior in an evolutionary and ecological context. The course includes an introduction to patterns of animal and human behavior, cell and physiological processes, the structure and function of nervous systems, the genetics of behavior, the principles of evolution, and behavioral ecology. It is useful for both science and non-science majors.

**BIOL 481**

**Honors Seminar in Biology 1 Unit**

*Same As:* HONOR 383  
*Prerequisite:* None  
*General Education:* AA/AS Area IV  
*Course Transferable to CSU*  
*Hours:* 12 hours LEC ; 18 hours LAB

Honors Seminars in Biology are special one-unit intensive courses for academically accomplished students or those with the potential for high academic achievement. In these seminars, students will study advanced topics from the area of biology. Enrollment limited to Honors students (see college catalog). This course is the same as HONOR 383. This course, under either name, may be taken a total of four times for credit on different topics. See “Cross-Listed Courses” in the catalog.

**BIOL 490**

**Science Skills and Applications .5 Unit**

*Prerequisite:* None  
*Corequisite:* Current enrollment in a science course (designated by ASTR, BIOL, CHEM, GEOG, GEOL, PHYS, or PS)  
*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 – majors, non-majors, and allied health courses. 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. Registration is open through the twelfth week of the semester. This course may be taken four times. Credit/ No Credit only.

**BIOL 495**

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

*Prerequisite:* None  
*Course Transferable to CSU*  
*See UC Limitations & Counselor*  
*Hours:* 18 hours LEC ; 54 hours LAB

**BIOL 498**

**Work Experience in Biology 1-4 Units**

*Prerequisite:* None  
*Course Transferable to CSU*  
*Hours:* 300 hours LAB

This course provides students with opportunities to develop marketable skills in preparation for employment or advancement within their current job. Course content will include understanding the application of education to the workforce; completion of required forms, which document the student’s progress and hours spent at the work site; and developing workplace skills and competencies. During the course of the semester, the student is required to fulfill an 18 hour orientation and 75 hours of related paid work experience, or 60 hours of unpaid work experience for one unit. An additional 75 or 60 hours of related work experience is required for each additional unit. The course may be taken again when there is new or expanded learning on the job for a maximum of 16 units.

**BIOL 499**

**Experimental Offering in Biology .5-4 Units**

*Prerequisite:* None  
*Course Transferable to CSU*  
*See UC Limitations & Counselor*  
*Hours:* 18 hours LEC ; 54 hours LAB