# BIOLOGY

## Biochemistry

See Biochemistry Program (http://catalog.css.edu/programs-az/arts-sciences/biochemistry-chemistry-math-physics/biochemistry-bs/).

## Biology Department

Biology in the broadest sense is the study of life. It is a diverse subject and understanding it requires a background in all the sciences. Students synthesize that knowledge to understand the living world, a world that is both remarkably unified and wonderfully diverse. Our graduates are well prepared for admission to various health professional schools such as medical school, PA school, or pharmacy school, as well as graduate school in the biological sciences, or work in life science industries or organizations.

Students majoring in biological sciences complete a core curriculum in biology, chemistry, math and physics. However, the Biology major has a flexible curriculum and allows students to tailor their elective coursework to match their interests and career goals. A major in biology requires 34 total biology credits. Students should work closely with their faculty advisor to design a suitable academic course plan. Students must achieve a minimum grade of "C" in biology courses and a minimum grade of "C-" in supporting science courses to complete the requirements for the major.

## Programs

The Biology Department offers these programs:

- Biology, B.A. (http://catalog.css.edu/programs-az/arts-sciences/biology/biology-ba/)
- Biology Minor (http://catalog.css.edu/programs-az/arts-sciences/biology/biology-minor/)

## Secondary Education

A B.A. in Biology with Middle and Secondary Education (http://catalog.css.edu/programs-az/stender-business-leadership-professional-studies/education/middle-secondary-education/biology-ba-secondary-education-curriculum/) is also available.

## Contact Information

biology@css.edu

## Biology Courses

**BIO 1036 - Biology of the Cell - 2 cr.**
Introduces cell biology, intended for students who are not majoring in the natural sciences. Topics include the study of structure and function of proteins, carbohydrates, lipids, and nucleic acids; study of the structure, function and behavior of cells; an introduction to cellular metabolism. 2 class hours.
**Prerequisite Courses:** CHM 1040 or CHM 1110

**BIO 1102 - Human Biology and Heredity (Conceptions : VCNS - Natural Science) - 0,4 cr.**
Studies the structure, function and heredity of the human body, primarily for students with minimal science background. The content includes cellular structure and function, organ systems of the body, problems in development and function, basic principles of heredity, nature of gene function, inheritance of some human traits, and mechanisms of evolution. This course is not counted toward the biology major.

**BIO 1103 - Current Environmental Topics (Conceptions : VCNS - Natural Science) - 4 cr.**
Discussion of environmental problems which have developed through man's impact on nature: water resources, food supply, overpopulation and pollution problems are stressed.

**BIO 1104 - Life Science - 0,4 cr.**
Covers a broad range of topics in the life sciences from cell structure and function to ecology. 3 class hours, 2-hour lab. This course is not counted toward the biology major.

**BIO 1115 - Global Problems, Scientific Solutions - 4 cr.**
Team-taught, topic-based course designed to address global challenges from a scientific standpoint with consideration for societal, policy, or political implications. This course will emphasize team-work, information literacy in the biological sciences, problem-solving skills and oral and written communication. This course is required of all biology majors and a minimum grade of C is needed to move into BIO 1125.

**BIO 1116 - Novel Antimicrobial Discovery - 2 cr.**
Students will participate in an original, discovery-based laboratory research project designed to identify novel antibiotics from soil bacteria. This course will focus on building skills in experimental design, foundational lab techniques, data analysis, and the process of scientific discovery. This course is required of all biology majors.

**BIO 1125 - Foundations in Biology - 4 cr.**
An investigation of living systems with particular emphasis on the molecular and cellular levels of organization within the various kingdoms of life. The concepts introduced in this class form a broad foundation for understanding biology, which is the study of all life. Biology is multidisciplinary and integrates genetics, evolution, ecology, chemistry, physics, mathematics and cellular biology, and we will begin to make connections among these disciplines. All biology and biochemistry majors must pass BIO 1125 with a grade of C or better.
**Prerequisite Courses:** minimum grade of C in BIO 1115.

**BIO 1210 - Introduction to Biology - 2 cr.**
Introductory Biology course for non-majors. The focus is on the core topics of cells, genes, evolution, and ecology with emphasis placed on concepts and applications that are essential for the student to be biologically literate.

**BIO 2002 - The Human Body in Health and Disease - 4 cr.**
Combined material of Anatomy/Physiology, Pathophysiology and Medical Terminology are necessary as background basis for students in the Health Information Management graduate program. Intended for online HIM graduate students who have not completed the sequenced courses at the college level. Topics include: Chemistry/Cell Biology Basics, Neoplasia, and the Anatomy/Physiology and Pathophysiology of the Circulatory, Nervous, Musculo-Skeletal, Urinary, Respiratory, Digestive, Endocrine and Reproductive Systems.

**BIO 2005 - Essential Anatomy and Physiology - 4 cr.**
A semester course that combines essential topics of anatomy and physiology for Health Informatics and Information Management students. Topics include: Chemistry/Cell Biology Basics and the anatomy and physiology of the Integumentary, Circulatory, Nervous, Musculo-Skeletal, Urinary, Respiratory, Digestive, Endocrine and Reproductive Systems.

**BIO 2010 - Bacteriophage Discovery - 2 cr.**
Explores the laboratory techniques and biology related to bacteriophage. Students will purify bacteriophage from soil, visualize bacteriophage using electron microscopy and isolate bacteriophage genomic material for analysis and nucleic acid sequencing.

**BIO 2015 - Bacteriophage Genomics - 2 cr.**
Explores the genomes of mycobacteriophages using bioinformatics tools. The sequenced genome of at least one novel mycobacteriophage isolated during Bacteriophage Discovery is functionally annotated using a series of computer-based analyses. Using this information, additional comparative genomics projects are performed to deepen the understanding of the genomes of the class bacteriophages and other phages that infect Mycobacterium smegmatis.
**Prerequisite Courses:** BIO 2010

**BIO 2020 - Microbiology - 3 cr.**
Introduces microbiology including study of the morphology, diversity, evolution, physiology, genetics, metabolism, ecology, biotechnology, pathogenicity, immunology, epidemiology and control of microorganisms.
**Prerequisite Courses:** BIO 1036 or BIO 1125

**BIO 2021 - Microbiology Lab - 1 cr.**
Introduces microbiological laboratory work covering techniques and experiments in microbial structure, metabolism, growth and identification. Recommended for all biology majors.
**Prerequisite Courses:** BIO 2020 and BIO 1036 or BIO 1125

**BIO 2510 - Human Anatomy and Physiology I - 0,4 cr.**
Study of human anatomy and physiology. Topics include an introduction to cells, tissues, systems organization, osteology, fluid compartments, gross and microscopic anatomy, physiology of the circulatory system, and the gross anatomy of musculature. This course will be geared towards pre-nursing and pre-health occupational students with an emphasis on how basic anatomy and physiology functions in human health.
**Prerequisite Courses:** BIO 1125 or BIO 1036

**BIO 2520 - Human Anatomy and Physiology II - 0,4 cr.**
Study of human anatomy and physiology. Topics include the physiology of the circulatory, respiratory, urinary, reproductive, endocrine, and defense systems. This course will be geared towards pre-nursing and pre-health occupational students with an emphasis on how basic anatomy and physiology functions in human health.
**Prerequisite Courses:** BIO 2510

**BIO 2777 - Topics - 1-4 cr.**
Lower-division courses on one-time-only basis. Classes can be developed to respond to student interest in specific areas of current interest. The number of class hours equals the number of credits.
**Prerequisite Courses:** instructor permission.

**BIO 3005 - Concepts in Pathophysiology - 4 cr.**
A semester course on pathophysiology that is necessary background for students in the Health Information Management undergraduate program. Topics include: Chemistry/Cell Biology Basics, Neoplasia, Pathophysiology of the Circulatory, Nervous, Musculo-Skeletal, Urinary, Respiratory, Digestive, Endocrine and Reproductive Systems.
**Prerequisite Courses:** BIO 2005

**BIO 3100 - Life's History - 4 cr.**
Study of the events concerning the creation of the solar system, earth and life. The evolutionary history of life and the processes of natural selection will be emphasized. Follow Earth's 4.6 billion year history as it unfolds, producing from so simple a beginning endless forms most beautiful and wonderful.
**Prerequisite Courses:** BIO 1125, Must be in second year or higher in college. Recommended for all Biology Majors.

**BIO 3110 - Invertebrate Zoology - 4 cr.**
Study of the biology of selected groups of terrestrial, freshwater and marine invertebrate animals. This course contains a laboratory component and provides an overview of the evolution, morphology, ecology, physiology, classification, life histories and habits of the major phyla of invertebrate animals with emphasis on organizational, functional, and ecological significance. This course counts as a Biology elective.
**Prerequisite Courses:** BIO 1125

**BIO 3120 - Vertebrate Zoology - 4 cr.**
Study of the biology of vertebrate animals. This course contains a laboratory component and provides an overview of the evolution, morphology, ecology, physiology, classification, life histories and habits of vertebrate animals with emphasis on organizational, functional, and ecological significance. This course counts as a Biology elective.
**Prerequisite Courses:** BIO 1125

**BIO 3210 - Field Biology - 4 cr.**
Study of the contemporary and traditional field methods used by biologists. Topics include techniques used in the areas of entomology, floristics, ornithology, mammalogy and mapping. 4 hour lab course.

**BIO 3220 - Plant Systematics - 0,4 cr.**
Introduces systematics of vascular plants with emphasis on identification of woody plants, representative families, terminology and use of taxonomic keys.
**Prerequisite Courses:** BIO 1125

**BIO 3300 - Virology - 2 cr.**
A thorough investigation of viral biology from the perspective of both the virus and host cell. Topics covered include viral structure and classification, interactions between the virus and host cell, methods of virology, viral diseases, viral oncogenesis, and therapeutic uses of viruses.
**Prerequisite Courses:** BIO 2020

**BIO 3450 - Super Physiology - 4 cr.**
Comic books and other fictional outlets depict human characters of "super" ability; they can fly, transform, withstand extreme temperatures, and utilize a fantastic suite of senses and strengths that are otherwise unfamiliar to humans. In this course, we will explore the animal kingdom to highlight real life examples of these super traits and the extreme physiological adaptations that allow these super traits to exist. Specializations of systemic and molecular physiology will be studied, including topics of nutrition, energy, temperature, movement, respiration, water conservation, and excretion.
**Prerequisite Courses:** BIO 1125

**BIO 3500 - Genetics - 0-4 cr.**
In-depth study of the principles of genetics, including patterns of inheritance, structure and function of genetic material, flow of genetic information, and control of gene expression. This course is required of all biology and biochemistry majors.
**Prerequisite Courses:** BIO 1125

**BIO 3600 - Cell Biology - 4 cr.**
Study of eukaryotic and prokaryotic cells and viruses to include membranes, receptor proteins, organelles, cytoskeleton, sorting and trafficking, cellular communication, the extracellular matrix, and experimental methods.
**Prerequisite Courses:** BIO 1125

**BIO 3777 - Topics - 0-4 cr.**
Advanced courses on one-time-only basis. In-depth classes, narrowed in scope to respond to student interest in specific areas corresponding to faculty interest and expertise. The number of class hours equals the number of credits.
**Prerequisite Courses:** BIO 1125

**BIO 4000 - Outcomes Assessment - 0 cr.**
The Biology department is interested in how our students compare to other students at the national level. This comparison is made by performance on standardized tests that allow us to see areas within biology where our students perform well or not as well. The results of these tests are used only in aggregate to identify our department's area of strengths and weaknesses. This course is required of all biology majors and is to be taken in the spring semester of the senior year.

**BIO 4125 - Biology of Aging - 2 cr.**
Aging changes evident in humans as the result of time interacting with molecular mechanisms of biological systems. Current knowledge of these mechanisms will be examined, followed by an application of the basic principles of biological aging to the systems of the body.
**Prerequisite Courses:** a completed course in Anatomy/ Physiology.

**Equivalent Course:** BIO 5125

**BIO 4160 - Molecular Biology - 2 cr.**
Study of current molecular biology research techniques, hypothesis testing and communication of results. Topics may include molecular cloning, plasmid isolation, restriction digest analysis, polymerase chain reaction (PCR), and DNA sequencing.
**Prerequisite Courses:** BIO 3500

**BIO 4170 - Ecology - 0,4 cr.**
Study of the basic principles of ecology, interrelationships and identification of plants and animals making up principal communities of this region, the dynamic balance of communities and the productivity of natural resources. The course includes a research experience. 3 class hours, 3-hour lab.
**Prerequisite Courses:** BIO 1125

**BIO 4180 - Animal Behavior - 0,4 cr.**
Introduces the basic questions and study of animal behavior. From an evolutionary perspective we investigate the adaptive value of behaviors such as foraging, communication, predator avoidance, dispersal, sociality, parental investment and mating systems, among other topics. Laboratory work, including an independent research project, under field conditions emphasizes the measurement and analysis of animal behavior.
**Prerequisite Courses:** (BIO 1102 or BIO 1125) and PSY 3331

**BIO 4350 - Advanced Laboratory - 1-4 cr.**
Introduces original laboratory research in collaboration with a faculty member; requiring literature searching, experimental planning, a minimum of 4-10 hours laboratory work per week depending on credit, a final written report and a seminar presentation of the work. The subject of the research could be of the student's own choosing.
**Prerequisite Courses:** junior standing, application according to department policy and instructor permission.

**BIO 4555 - Internship in Biology - 1-4 cr.**
Internship.

**BIO 4777 - Topics - 1-4 cr.**
Topics

**BIO 4999 - Problems in Biology - 0-16 cr.**
Advanced study and research in an area of special interest. By instructor permission.

**BIO 5125 - Biology of Aging - 2 cr.**
Biology of Aging is a course designed to allow study and understanding of the principles of aging applied to the anatomical and physiologic systems of the body. The course is divided into three portions; (1) Examination of the basic principles of aging from the population level; (2) Events of aging seen at the cellular level; and (3) Events of aging observed at the system level of the body.
**Equivalent Course:** BIO 4125