

# Biology

Biology is the science of life and living organisms, including their structure, function, growth, origin, evolution, and distribution. Students take biology courses to prepare for a biology major, to fulfill general education requirements, and to meet prerequisites for related courses. A bachelor's degree in biology can lead to careers in areas such as health sciences, biotechnology, research, environmental sustainability, marine science, and education.

## Academic and Career Pathway

Math and Sciences (<https://www.miracosta.edu/academics/degree-and-certificate-programs/math-and-sciences/>)

## Contact Information

**Chair:** Suzie Bailey

**Dean:** Michael Fino

<https://www.miracosta.edu/academics/degree-and-certificate-programs/math-and-sciences/biology/index.html> (<https://www.miracosta.edu/academics/degree-and-certificate-programs/math-and-sciences/biology/>)

**Department:** Biological Sciences

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## Full-Time Faculty

Suzie Bailey

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## Associate Degrees

### Associate in Science Degree

#### Biology for Transfer

Students completing this associate degree will have completed lower-division major preparation requirements for a biology degree, an emphasis or option within a biology degree, or a degree considered similar to biology at a participating California State University (CSU) campus.

Following transfer to a participating CSU campus, students will be required to complete no more than 60 units to obtain a bachelor's degree; however, some CSU campuses may require additional lower-division major preparation. This degree may not be appropriate preparation for students transferring to a CSU campus not accepting this degree or to a university or college that is not part of the CSU system. Students should consult with a MiraCosta counselor for further information regarding the most efficient pathway to transfer as a biology major and to determine which CSU campuses are participating in this program.

#### Graduation Requirements

- ▶ Complete a minimum of 60 CSU-transferable semester units.
- ▶ Complete all courses in the major with a "C" or "P" or better.
- ▶ Complete the Cal-GETC general education pattern.

- ▶ Obtain a minimum CSU-transferable grade point average of 2.0.
- ▶ Complete a minimum of 12 semester units in residence at MiraCosta College.

#### Program Student Learning Outcomes

Upon successful completion of the program, students are able to do the following:

- ▶ Apply their understanding of the interconnections and interactions of molecular, cellular, and organismal levels of biological organization to the evaluation of biological phenomena.
- ▶ Demonstrate their understanding of the relationship between molecular, cellular, and organism-level structure and the relevant cellular, organismal, and ecological contexts in which they arose through adaptation.
- ▶ Apply the process of science and appropriate quantitative skills to the analysis, interpretation and evaluation of biological phenomena at various levels of biological organization.

#### Course Requirements

Required courses:

BIO 202	Foundations of Biology: Evolution, Biodiversity, and Organismal Biology	4
BIO 204	Foundations of Biology: Biochemistry, Cell Biology, Genetics, and Molecular Biology	4

List A: 23-25

CHEM 150	General Chemistry I: For Science Majors
CHEM 151	General Chemistry II: For Science Majors
MATH 150 or MATH 150H or MATH 150S	Calculus and Analytic Geometry I Calculus and Analytic Geometry I (Honors) Calculus and Analytical Geometry I with Integrated Support

Choose one sequence below:

PHYS 111 & PHYS 112	Introductory Physics I and Introductory Physics II
PHYS 151 & PHYS 152	Principles of Physics I and Principles of Physics II

**Total Units** **31-33**

**NOTE:** Students are strongly advised to select courses that meet lower-division major preparation requirements at their transfer university and to complete the History, Constitution, and American Ideals requirement prior to transfer.

## Courses

### **BIO 102: Introductory Biology: Ecology and Environmental Biology**

Units: 4

Prerequisites: None

Acceptable for Credit: CSU, UC

Lecture 3 hours, laboratory 3 hours.

Course Typically Offered: Fall, Spring

This general education life science course is intended for non-science track students. Using an interdisciplinary approach, students explore ecology and address current environmental issues, while seeking sustainable solutions. Course activities may include lectures, group discussions, lab observations and experimentation, simulation exercises, field work, case studies, and research projects.

### **BIO 103: Introductory Biology: Animal Diversity**

Units: 3

Prerequisites: None

Enrollment Limitation: Not open to students with prior credit in BIO 202.

Acceptable for Credit: CSU, UC

Lecture 3 hours.

Course Typically Offered: Fall, Spring

This course introduces non-science track students to animal diversity and incorporates biological concepts such as evolution, ecology, behavior, physiology, and development. Course activities may include lectures, assessments, class discussions, research projects, reflection and/or application assignments, and observational activities.

### **BIO 104: Introductory Biology: Botany (Plant Life)**

Units: 4

Prerequisites: None

Acceptable for Credit: CSU, UC

Lecture 3 hours, laboratory 3 hours.

Course Typically Offered: Spring

This introductory course examines plant anatomy, physiology, and classification. It provides a broad perspective of biological concepts and principles and covers both unicellular and multicellular systems. Topics include structure and function of life, metabolism and manipulation of energy, cell division, genetics, taxonomy, and the evolution and adaptation of living organisms. Field trips may be required.

### **BIO 105: Introductory Biology: Biotechnology in Society**

Units: 3

Prerequisites: None

Acceptable for Credit: CSU, UC

Lecture 3 hours.

Course Typically Offered: Fall, Spring, and Summer

This introductory course relates basic biology to the emerging field of biotechnology. Topics include fundamental chemical processes common to all cells, biomolecular chemistry, cellular and molecular biology, classical and molecular genetics, and the molecular basis of immunology and cancer. The course highlights current advances in biotechnology, such as cloning, recombinant DNA technology, and gene therapy as well as the applications, social consequences, and ethical implications of biology and biotechnology in medicine and agriculture. UC CREDIT LIMITATION: Credit for BIO 103, BIO 105, BIO 110, or BIO 111.

### **BIO 107: Introductory Biology: Marine Biology**

Units: 4

Prerequisites: None

Acceptable for Credit: CSU, UC

Lecture 3 hours, laboratory 3 hours.

Course Typically Offered: Fall, Spring

This general education life science course introduces basic biological concepts in the context of learning about life in the ocean. The course emphasizes organismal diversity, how animals have adapted to the physical environment and anthropogenic impacts on the ocean including fisheries sustainability. The laboratory portion of the course combines classroom investigation with field exploration and emphasizes the scientific method, current research in the field of marine biology and the development of field sampling techniques. Students attend local field trips.

### **BIO 108: Introductory Biology: Ocean Ecology and Sustainability**

Units: 3

Prerequisites: None

Acceptable for Credit: CSU, UC

Lecture 3 hours.

Course Typically Offered: Fall, Spring

This introductory life science course examines the ocean from an ecological perspective with an emphasis on environmental sustainability. Topics include patterns in the marine realm, interactions between organisms and their environment, the flow of energy through food webs, the structure of marine communities and issues related to environmental sustainability and human impacts on ocean ecosystems. Students discuss climate change, reducing our carbon footprint, the impacts of plastics and other pollution, and exploitation of marine resources. This class prepares students for moving forward toward a more sustainable future.

**BIO 108L: Introductory Biology: Ocean Ecology and Sustainability Lab**

Units: 1

Prerequisites: BIO 107 or BIO 108.

Enrollment Limitation: Concurrent enrollment in BIO 107 or BIO 108 if prerequisite not met.

Acceptable for Credit: CSU, UC

Laboratory 3 hours.

Course Typically Offered: Spring

This general education life science lab course offers students an experimental approach to examining current topics in the field of ocean ecology with a strong emphasis on sustainability. The course introduces students to current laboratory and field-based research methods, allowing them to develop skills in experimental design and then practice their skills by engaging in instructor-led independent research. This course supports the content of BIO 108 and includes local field trips.

**BIO 110: Introductory Biology: Preparation for Pre-Health Professions (Lecture/Lab)**

Units: 4

Prerequisites: None

Enrollment Limitation: Not open to students with prior credit in BIO 111 and BIO 111L.

Acceptable for Credit: CSU, UC

Lecture 3 hours, laboratory 3 hours.

Course Typically Offered: Fall, Spring, and Summer

This entry-level course provides a broad perspective of biological concepts and principles with an emphasis on human health. Topics include the process of scientific inquiry, the biochemistry of biomolecules, metabolism and manipulation of energy by plants and animals, cell division, classical and molecular genetics, development, and the evolution and adaptation of living organisms. The laboratory component of this course provides direct participation in experiments, demonstrations, and discussions related to fundamental concepts in biology. This course is designed for pre-health profession students. UC CREDIT LIMITATION: Credit for BIO 103, BIO 105, BIO 110, or BIO 111.

**BIO 111: Introductory Biology: Preparation for Pre-Health Professions (Lecture)**

Units: 3

Prerequisites: None

Advisory: BIO 111L

Enrollment Limitation: Not open to students with prior credit in BIO 110.

Acceptable for Credit: CSU, UC

Lecture 3 hours.

Course Typically Offered: Fall, Spring, and Summer

This entry-level course provides a broad perspective of biological concepts and principles with an emphasis on human health. Topics include the process of scientific inquiry, the biochemistry of biomolecules, metabolism and manipulation of energy by plants and animals, cell division, classical and molecular genetics, development, and the evolution and adaptation of living organisms. This course is designed for pre-health profession students. UC CREDIT LIMITATION: Credit for BIO 103, BIO 105, BIO 110, or BIO 111.

**BIO 111L: Introductory Biology: Preparation for Pre-Health Professions (Lab)**

Units: 1

Prerequisites: BIO 111

Enrollment Limitation: Concurrent enrollment in BIO 111 if prerequisite not met. Not open to students with prior credit in BIO 110.

Acceptable for Credit: CSU, UC

Laboratory 3 hours.

Course Typically Offered: Fall, Spring

This laboratory accompaniment to BIO 111 provides direct participation in experiments, demonstrations, and discussions related to fundamental concepts in biology. This course further develops the student's understanding of topics introduced in the lecture.

**BIO 202: Foundations of Biology: Evolution, Biodiversity, and Organismal Biology**

Units: 4

Prerequisites: Knowledge, skills, and abilities at the intermediate algebra level as determined by the math placement process.

Advisory: Any college-level biology course with an organismal or population focus (e.g., BIO 102, BIO 103, BIO 104, BIO 107, BIO 108, BIO 110, BIO 204, BIO 210, BIO 220, or BIO 230)

Acceptable for Credit: CSU, UC

Lecture 3 hours, laboratory 3 hours.

Course Typically Offered: Fall, Spring

This course surveys the organismal/meta-organismal half of biological disciplines. Topics include the taxonomy and physiology of prokaryotes and basal eukaryotes; the taxonomy, developmental biology, and physiology of plants and animals; and single-species population dynamics and interspecies interactions in communities. The laboratory emphasizes evolutionary process and mechanism, phylogeny reconstruction, comparative anatomy/physiology/survey of plants and animals, and life history evolution. The laboratory portion also includes local field trips or online alternatives. C-ID BIOL 135S (with BIO 204) and BIOL-140.

**BIO 204: Foundations of Biology: Biochemistry, Cell Biology, Genetics, and Molecular Biology**

Units: 4

Prerequisites: CHEM 150.

Enrollment Limitation: Not open to students with prior credit in BIO 204H.

Acceptable for Credit: CSU, UC

Lecture 3 hours, laboratory 3 hours.

Course Typically Offered: Fall, Spring

This course surveys the molecular half of biological disciplines. Topics include biological molecules, metabolic biochemistry, cell biology, molecular biology, and genetics. The laboratory emphasizes modern methods in cell and molecular biology, classical genetics, and experimental design. C-ID BIOL-135S (with BIO 202) and BIOL-190.

## **BIO 210: Human Anatomy**

Units: 4

Prerequisites: BIO 110, BIO 111, or a minimum 3-unit course in biology that presents principles of cellular life in its curriculum.  
Enrollment Limitation: Not open to students with prior credit in BIO 210H.

Acceptable for Credit: CSU, UC

Lecture 2 hours, laboratory 6 hours.

Course Typically Offered: Fall, Spring, and Summer

This course follows a systemic approach by combining microscopic studies of tissues (histology) and organs along with gross/visual anatomical studies of the human body. Students learn mammalian and human anatomy by working with preserved mammalian specimens and human cadavers. Because the course presents applied clinical situations, it is recommended for students majoring in the health sciences: massage therapy, kinesiology, physical therapy, nursing, and physician assistant. C-ID BIOL-110B.

## **BIO 220: Human Physiology**

Units: 4

Prerequisites: BIO 110, BIO 111, BIO 204, or BIO 210.

Advisory: CHEM 115 or CHEM 112

Acceptable for Credit: CSU, UC

Lecture 3 hours, laboratory 3 hours.

Course Typically Offered: Fall, Spring, and Summer

This course presents the interrelationships of the various organ systems, based upon the molecular and cellular activities of the organs that comprise those systems. It emphasizes the integration of body systems for maintaining homeostasis through regulated metabolism and coordinated flow of information. This course is designed for students majoring in pre-medicine, pre-nursing, allied health fields, and physical education. C-ID BIOL-120B.

## **BIO 230: Introduction to Microbiology**

Units: 5

Prerequisites: BIO 220, CHEM 115, CHEM 112, CHEM 140, or CHEM 150.

Acceptable for Credit: CSU, UC

Lecture 3 hours, laboratory 6 hours.

Course Typically Offered: Fall, Spring

This course introduces the fundamental concepts of microbiology and the use of the scientific method applied to the study of bacteria and other microorganisms. Topics include the history, morphology, genetics, and physiology of microbes. The laboratory emphasizes methods for isolating, culturing, identifying, enumerating and controlling bacteria.

## **BIO 292: Internship Studies**

Units: 0.5-14

Prerequisites: None

Corequisite: Complete 54 hours of work per unit, paid or unpaid.

Enrollment Limitation: Instructor, dept chair, and Career Center approval. Fourteen unit maximum in any combination of work experience education and/or internship studies per semester.

Acceptable for Credit: CSU

Course Typically Offered: To be arranged

This course provides students the opportunity to apply the theories and techniques of their discipline in an internship position in a professional setting under the instruction of a faculty-mentor and site supervisor. It introduces students to aspects of the roles and responsibilities of professionals employed in the field of study. Topics include goal-setting, employability skills development, and examination of the world of work as it relates to the student's career plans. Students must develop new learning objectives and/or work/intern at a new site upon each enrollment.

## **BIO 296: Topics in Biology**

Units: 1-4

Prerequisites: None

Acceptable for Credit: CSU

Lecture 1 hour.

Lecture 2 hours.

Lecture 3 hours.

Lecture 4 hours.

Course Typically Offered: To be arranged

This course gives students an opportunity to study topics in Biology that are not included in regular course offerings. Each Topics course is announced, described, and given its own title and 296 number designation in the class schedule.

## **BIO 299: Occupational Work Experience Education**

Units: 0.5-14

Prerequisites: None

Corequisite: Complete 54 hours of work per unit, paid or unpaid.

Enrollment Limitation: Career Center approval. Fourteen unit maximum in any combination of work experience education and/or internship studies per semester.

Acceptable for Credit: CSU

Course Typically Offered: Fall, Spring, and Summer

This course is intended for students who are employed in a job directly related to their major or career area of interest. It allows such students the opportunity to apply the theories and skills of their discipline to their position and to undertake new responsibilities and learn new skills at work. Topics include goal-setting, employability skills development, and examination of the world of work as it relates to the student's career plans. Students must develop new learning objectives and/or work/intern at a new site upon each enrollment.

**BIO 340: Molecular Mechanisms of Disease**

Units: 3

Prerequisites: BIO 105, BIO 110, BIO 111, or BIO 204, and CHEM 150.

Enrollment Limitation: Only open to students enrolled in the bachelor's degree program in biomanufacturing at MiraCosta College.

Lecture 3 hours.

Course Typically Offered: Fall

This course focuses on the molecular basis of human disease. Topics include genetic, metabolic, signaling, developmental, and infectious diseases as well as the biological mechanisms of immunity, cancer, and aging. This course develops students' understanding of the biological basis of human disease that will allow them to evaluate technological advances in therapeutics and diagnostics. This course is open only to students enrolled in the biomanufacturing bachelor's degree program.