BIOLOGY

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** Faculty Early Retirement Program*

Programs Offered

Bachelor of Arts in Biology

Bachelor of Science in Biology

Master of Science in Biology

Minor in Biology

The Department of Biology offers a dynamic learning environment, exciting research and training opportunities and intensive mentoring of students at all levels. Our distinguished faculty members are dedicated educators and active scholars who engage in original research to address diverse topics in the biological sciences. The overall mission of our undergraduate and graduate programs is to educate the next generation of scholars, professionals and citizens so that they are prepared to meet the biological, environmental and technological challenges of the future.

Students in the Department of Biology may select from two broadly based Bachelor's degree programs or a Master of Science degree. Within the Bachelor of Science program, students can select a more focused concentration (see below). The educational and research activities in the department explore the full range of biology, including molecular and cell biology, physiology, marine biology, microbiology, genetics, ecology, conservation biology, evolutionary biology, botany and zoology. We are nationally recognized for our programs and research in marine biology.

The Master's program is comprised of an active cohort of graduate students engaged in original research with faculty members in all areas of biology covered in the department. External funding sources often support graduate student research. Graduate student support includes teaching associate positions that involve close mentoring relationships with instructional faculty.

Laboratory instruction includes use of modern facilities to provide students with valuable hands-on experience in the latest techniques and research methods. Excellent laboratory and greenhouse facilities exist for maintaining live material for education and research. A radioisotope laboratory is also available.

Field courses draw upon the unparalleled diversity of habitats in the North Bay region. They also capitalize on two spectacular nature preserves: Fairfield Osborn Preserve and Galbreath Wildlands Preserve, administered by Sonoma State University. In addition, the department maintains museum collections of local plants, algae and fungi (North Coast Herbarium of California), vertebrates (Jack Arnold Vertebrate Collection) and insects and other invertebrates.

Careers in Biology

The biology curriculum, supported by physical sciences and mathematics, is designed to provide students with a strong background in the principles of biology and their application to current research questions and biological resource management challenges. This combination of breadth and in-depth instruction allows students to develop the intellectual foundations, skills and flexibility needed to deal with the specific biological concerns of today and future needs of the profession.

Biology graduates enter careers in many areas including health care, biological and biotechnology research, education, and agency positions in parks, recreation, conservation and restoration. Graduates from the department have an outstanding record of acceptance in advanced degree programs in health professions and graduate programs.

Biology Degree Plans

Bachelor of Arts
General Biology

Bachelor of Science
General Biology
Molecular Biology, Cell Biology, and Physiology Concentration
Ecology and Evolutionary Biology Concentration

Many students are well served by the B.A. and B.S. General Biology plans, which do not include a specific concentration. Students seeking a B.S. may also select one of two concentrations. The B.A. and B.S. share a common lower-division core, which allows beginning students to select a degree plan after the first or second year. Students should contact the department and their assigned advisor for additional advice concerning how to complete the requirements for various concentrations.

Preparation for Applying to Health Professions Programs

Students majoring in biology and intending to pursue careers in the health care profession may follow the guidelines for a B.S. degree, or a B.A. degree with the addition of MATH 161, CHEM 335B and 336A, and PHYS 210AB and 209AB. They are encouraged to enroll in SCI 150, Introduction to Careers in the Health Professions, during their first fall semester.

For admission to most health profession schools, regardless of major, it is typically recommended or required that specific upper-division biology courses be incorporated into the B.A. or B.S. degree. These include:

BIOL 328 Vertebrate Evolutionary Morphology
BIOL 340 General Bacteriology
BIOL 342 Molecular Genetics
BIOL 344 Cell Biology
BIOL 349 Animal Physiology
BIOL 472 Developmental Biology
BIOL 480 Immunology
An upper-division biochemistry course (e.g. CHEM 446) is often required/ recommended.

Secondary Education Teaching Credential Preparation in Life Science

Contact the department chair for information on completing a biological sciences preparation program for a Single Subject Credential.

Preparation for Careers in the Marine Sciences

As a coastal university, we provide numerous courses that emphasize the biology of marine life or use marine organisms as models for understanding broader topics in biology. Students with interests in marine biology or other marine sciences can choose core classes and electives that emphasize this area, and they may also work on marine research projects in faculty laboratories and in the field.

Degree Requirements

(See page 69 for a sample four-year program.)

	B. A.	*B. S.*
General Education (50 units, 12 units covered by major requirements in math and science)	38	38
Lower-Division Biology (BIOL 121, 122, 123)	12	12
Upper-Division Biology Core	16	16
Upper-Division Biology Electives (as specified by concentration)	15	12-16
Research Experience	--	3
Physical Sciences and Mathematics:		
CHEM 115AB	10	10
CHEM 335A/336A*	3	3-5
CHEM 335B	--	3
CHEM 445 or 446*	--	3
MATH 165	4	4
MATH 161	--	4
B. A.		
PHYS 210A and 209A or GEOL 102	4 or 3	--
B. S.		
PHYS 210A, 209A and 210B (PHYS 114 and 116 may substitute for 210A and 209A)	--	7-8
General Electives	*18-19*	*1-4*
Total units needed for graduation	**120**	**120**

** Required for Molecular Biology, Cell Biology, and Physiology concentration only.*

Upper-Division Biology Core

Complete one course from each of the following areas (additional courses from each area may be used as electives or may be required for particular concentrations):

Organismal Biology (4 Units)	
BIOL 322 Invertebrate Biology	4
BIOL 323 Entomology	4
BIOL 327 Vertebrate Biology	4
BIOL 329 Plant Biology	4
BIOL 340 General Bacteriology	4
Physiology (4 Units)	
BIOL 328 Vertebrate Evolutionary Morphology	4
BIOL 347 Environmental Physiology	4
BIOL 348 Plant Physiology	4
BIOL 349 Animal Physiology	4
Molecular And Cell Biology (4 Units)	
BIOL 342 Molecular Genetics	4
BIOL 344 Cell Biology	4
BIOL 383 Virology	4
BIOL 472 Developmental Biology	4
Ecology And Evolution (4 Units)	
BIOL 333 Ecology	4
BIOL 335 Marine Ecology	4
BIOL 337 Behavioral Ecology	4
BIOL 341 Evolution	4

Upper-Division Biology Electives

Biology major electives are upper-division courses beyond those used to fulfill the upper-division core and B.S. concentration specific requirements. Major electives are used to meet the total upper-division unit requirement for the B.A. or B.S. Major electives are chosen from the following:

1. Additional courses from the upper-division core areas and alternative courses in a concentration.
2. Any Biology course numbered greater than 320 (except BIOL 398). This list is subject to revision following this catalog edition. Students should check with their academic advisor for updates. Seniors may also take graduate courses (500 level) with permission of the instructor.

3. Supervisory courses in biology. These courses are: BIOL 393, 494, 495, 496, 498, and 499 (see Restrictions, below, for unit limits for these courses).
4. Biology colloquium, BIOL 390, may be taken twice (2 units total) for major credit.
5. A maximum of 4 units from courses related to biology from other departments, or from Biology non-majors courses numbered 200-319 (non-majors courses). To apply the units to the major, students are required to obtain written permission from their advisor and Department chair before taking these courses by completing course substitution forms (available from the department office). Acceptable courses in this category from other departments include: ANTH 301, 302, 318, 345, 414; CHEM 441, 445, 446; ENSP 315, 322; GEOL 313; KIN 360; PSY 451.

Restrictions

1. A maximum of 4 units taken in the Cr/NC grading mode may be applied to the major from the following courses: BIOL 390, 498, 499. All other courses in the Biology major must be taken in the traditional grading mode (A-F).
2. A maximum of 7 units from the following list of courses may be applied to the major: BIOL 390, 393, 494, 495, 496A, 496B, 498, and 499.

Bachelor of Science in Biology

Students may specify a particular concentration for the B.S. or may develop a general B.S. degree in consultation with a faculty advisor. Students normally complete additional physical science and mathematics for the B.S. after the first two years.

Courses from all 4 core areas are included in each concentration. The following are approved concentrations in the B.S. that will appear on a student's diploma. The upper-division major requirements for each are:

B. S. Molecular Biology, Cell Biology, and Physiology Concentration

BIOL 341 Evolution	4
BIOL 342 Molecular Genetics	4
BIOL 344 Cell Biology	4
One course from the Organismal Biology Core Area	*4*
One of the following two courses:	*4*
BIOL 348 Plant Physiology	
BIOL 349 Animal Physiology	
Research Experience (minimum of 3 units)	*3*
BIOL 494 Independent Research (1-3)	
BIOL 496A and 496B Honors Thesis (3-6)	
Department approved research course	
Additional upper-division major electives	*8*

B. S. Ecology and Evolutionary Biology Concentration

BIOL 333 Ecology	4
BIOL 341 Evolution	4
BIOL 342 Molecular Genetics	4
BIOL 485 Biometry	4
One course from the Organismal Biology Core Area	*4*
One course from the Physiology Core Area	*4*
Research Experience (minimum of 3 units)	*3*
BIOL 494 Independent Research (1-3)	
BIOL 496A and 496B Honors Thesis (3-6)	
Department approved research course	
Additional upper-division major electives	*8*

Minor in Biology

The minor consists of a minimum of 20 units in the Department of Biology. The purpose of the minor is to provide a student with a rigorous background in biology that supplements the student's major.

Students must develop a program in consultation with a faculty advisor in the Biology Department. Requirements of the Biology Minor are:

Two of the three lower-division major's courses listed below	*8*
BIOL 121 Diversity, Structure, and Function (4)	
BIOL 122 Genetics, Evolution, and Ecology (4)	
BIOL 123 Molecular and Cell Biology (4)	
Additional units in Biology	*12*

At least eight units must be upper-division courses for majors and at least one course must have a laboratory. One GE course in Biology, one unit of Biology Colloquium (BIOL 390), or a third lower-division Biology major's course may also be applied. All courses applied to the minor must be taken for a letter grade, except BIOL 390.

Master of Science in Biology

The Master of Science degree in the Department of Biology is a thesis program. Students complete 30 units of course work, which may include classroom courses in addition to mentor-supervised research units, to master the concepts and techniques in their chosen area. They also conduct original research under the direction of a member of the graduate faculty and write up their findings as a Master's Thesis.

Graduate students in the Department of Biology are supported through a variety of sources. The Department has a limited number of paid teaching associate positions available each semester. The University offers a limited number of tuition fee waivers for qualified teaching associates. In addition, students may receive research associate positions through their faculty mentor's research grants. Students can also obtain academic scholarships and financial aid.

Faculty in the Biology Graduate Program are actively involved in research in a wide range of disciplines, including ecology and restoration ecology, evolutionary biology, molecular and cell biology, biochemistry, physiology, microbiology, functional morphology, marine biology, and primatology.

Graduates find themselves with an enhanced understanding of biology and first-hand experience in the practice of science. Many M.S. students go on to doctoral programs; others pursue careers in teaching, research, environmental consulting, resource management, industry and health care professions.

Admission to the Program

To apply, you must submit: A) items 1-3 (listed below) to SSU's Admissions and Records Office, and B) copies of items 1-3 and originals of items 4 and 5 to the Department of Biology Graduate Coordinator. The application deadline in the department is January 31 for the fall semester and October 31 for the spring semester. The SSU Admissions and Records Office will notify students about the status of their applications.

1. University application obtained from the Admissions and Records Office.
2. Official copies of all undergraduate transcripts.
3. One-to-two page Statement of Purpose essay detailing your background in biology, objectives for graduate school, and career goals.
4. Two letters of recommendation from individuals familiar with your background in biology and able to comment on your potential for conducting original work.
5. Graduate Record Examination (GRE) scores for the General test. Biology Subject scores are recommended, but not required.

IMPORTANT: The complete application package must be received in the Admissions and Records Office and by the Biology Graduate Coordinator before an applicant will be considered for admission.

Admission to the program requires:

I. Meeting California State University admissions requirements.

II. Acceptance by a biology graduate faculty member to serve as a faculty advisor. Students should contact their potential faculty advisor prior to completing an application and refer to this communication in the Statement of Purpose.

III. Approval of the Graduate Committee. Applications will be reviewed for evidence that the prospective student is capable of initiating and performing original research. Applicants deficient in undergraduate course preparation will be expected to demonstrate competency before being advanced to candidacy. As a general guideline, the Department of Biology uses the following criteria to determine this potential:

An undergraduate degree in biology or equivalent, including:

A. One course in calculus or statistics;
B. One year of general chemistry and one semester of organic chemistry;
C. At least one other course in physical sciences;
D. Upper-division coursework demonstrating competence in three of four core areas (organismal biology; physiology; molecular or cellular biology; ecology or evolutionary biology);
E. GPA of 3.00 or higher in the last 60 units;
F. A score at or above the 50th percentile on each section of the General Examination of the GRE; and
G. Evidence in letters of recommendation of potential for conducting independent research in biology.

Admission requirements, policies, and other information related to the Master's Degree program in Biology can be found at: www.sonoma.edu/biology/graduate/

Sample Four-Year Program for Bachelor's Degree in Biology

FRESHMAN YEAR: 30-32 Units

Fall Semester (16 Units)	*Spring Semester (14-16 Units)*
BIOL 121 or 122 (4) (GE Area B2)	BIOL 121 or 122 (4) (GE Area B3)
CHEM 115A (5) (GE Area B1)	CHEM 115B (5)
GE Area A2, A3, or C3 (4)	GE Area A2, A3, or C3 (4)
GE Electives (3)	GE Electives (1-3)

SOPHOMORE YEAR: 28-32 Units

Fall Semester (12-16 Units)	*Spring Semester (16 Units)*
BIOL 123 (4)	MATH 165 (4) (GE Area B4)
CHEM 335A and/or 336A (3-5)	Support Course (4)
ENGL 101 (4) (GE Area A2)	GE Area A1 (4)
GE Electives (1-3)	GE Electives (4)

JUNIOR YEAR: 28-33 Units

Fall Semester (14-17 Units)	*Spring Semester (14-16 Units)*
Two BIOL UD Core (8)	Two BIOL UD Core (8)
BIOL UD Electives (2-4)	Support Course or BIOL UD Electives (3-4)
Support Course (4-5)	GE (3-4)

SENIOR YEAR: 30-35 Units

Fall Semester (15-17 Units)	*Spring Semester (15-18 Units)*
BIOL UD Electives (9-13)	BIOL UD Electives (12-14)
Support Course (3)	GE (3-4)
GE (3-4)	

TOTAL UNITS: 120