Biology, B.S.

DEPARTMENT

Department of Biology

Paul Crosbie, Interim Chair
Science Building, Room 106
559.278.2001
FAX: 559.278.3963
www.fresnostate.edu/biology

MN in Biology, Minor
MS in Marine Science, M.S.
MS in Biology, M.S.
MBT in Biotechnology, M.Bt.
BS in Biology, B.S.
CERT in Biotechnology, Certificate of Adv. Study
CRED in Professional Clear Foundation Level General Science
CRED in Single Subject Credential - Biological Science

The Department of Biology offers a diversified undergraduate program that matches the breadth and excitement of modern biology and prepares students for the hundreds of career opportunities that use biology as a foundation. The Bachelor of Science degree is awarded to those students who successfully complete the biology core and additional requirements and electives.

The biology major we offer has three programmatic goals:

1. To provide students with a solid foundation in all aspects of modern biology and also the intellectual skills that will serve as the basis for a lifetime of future achievement.
2. To provide students with the specialized educational opportunities that will allow them to compete successfully for careers in the biological sciences or for advanced studies in major doctoral programs.
3. To provide preprofessional students with the knowledge needed for advanced study in the many fields that build upon a biological foundation.

Our undergraduate biology major is excellent preparation for graduate programs in medicine, dentistry, pharmacy, veterinary medicine, optometry, doctoral programs, and many others.

The department offers a Master of Science in biology for qualified students who wish to explore some part of biology in greater depth. It can be integrated with a postbaccalaureate certificate in biotechnology.

Facilities

The department is housed in a well-equipped, modern science building. Among the specialized equipment and technologies available for students are DNA sequencers; Polymerase Chain Reaction (PCR) thermocyclers; apparati for conducting molecular and immunological analysis of nucleic acids and proteins; genetic recombination, including use of electroporation and gene guns; a bioinformatics computing laboratory; a proteomics work station; cell and tissue culture facilities; fermenters and bioreactors; fluorescence, confocal and 4-D microscopes; ultracentrifugation; radioactive materials methodologies; and metabolic studies on all types of life forms. Excellent greenhouse and animal care facilities, as well as media/reagent production complexes, support the instructional and research programs.

Fresno's proximity to both the Sierra Nevada and the Pacific coast provides a natural laboratory with numerous field trip opportunities that are rarely equaled at other institutions. High Sierra, Mediterranean, desert, foothill, coastal, and forest environments are all within a three-hour drive of the campus. The department maintains a wealth of field equipment to observe and collect wild organisms. A self-contained pond ecosystem offers a unique, on-campus study resource. The department also maintains extensive collections of museum specimens of insects, vertebrates and a herbarium. The department is a member of a consortium that manages and operates the Moss Landing Marine Laboratory (MLML). Students can study and conduct research at MLML, located on the Monterey Bay.

REQUIREMENTS

Bachelor of Science Degree Requirements

Biology Major

The Bachelor of Science in Biology is a 120-unit program. Of the total, 51 units are required to satisfy the university's General Education Program and 22 units are required by the Department of Biology to satisfy the biology core. The core curriculum is a sequence of courses required for all biology majors. The core curriculum builds the foundation upon which further learning in biology will be based. Additional requirements are listed below.

The biology degree program prepares students for entry into a wide range of careers, for further academic study at the graduate level, including the department's own M.S. in Biology, and for entrance into professional degree programs. Within the scope of the major requirements and electives, students may focus their studies in areas that best meet their future career needs. Students must consult an adviser for help in selecting courses appropriate to their interests and career objectives.

Students may also obtain an emphasis in marine science by selecting electives offered at the Moss Landing Marine Laboratories. An emphasis on cellular and molecular processes prepares students for the department's Master of Biotechnology and the Certificate of Advanced Studies in Biotechnology. Students preparing for the biotechnology certificate program should select a general microbiology course with laboratory and a general biochemistry laboratory course among their elective courses.

Students planning for graduate and professional schools should be aware that entrance requirements for those programs will often exceed the minimal requirements for a Biology B.S., particularly in the ancillary fields of chemistry, physics, and mathematics. An adviser should be consulted for specific information on graduate and professional school requirements.

Students should meet with an adviser a minimum of once a semester so the adviser can review the student's program and progress.

Major requirements (42 units)

- Biology Core (22 units)
- Other major requirements (20 units)

Biology Core (22 units)
The biology core is required of all majors (see Advising Notes.)
BIOL 1A, 1B and 1BL, 101, 102, 103, 104, 105 (22 units)

Other Major Requirements (20 units)
In addition to the core, all majors must complete major and additional requirements described as follows:

All students must take a minimum of three upper-division biology (BIOL) laboratory courses. Of these, at least one must be designated as a diversity course, and one must be designated as a physiology course, both identified below. The third course may be any other laboratory course, also identified below. All other courses taken as part of the major requirements are the choice of the student. One of these additional courses may be either BIOL 67A or BIOL 67B, but no other lower-division course may be used.

1. Diversity Courses:
BIOL 120, 122, 123, 124, 125, 130, 131, 132, 133, 134, 135, 136, 140, 143, 178; MSCI 112, 113, 124, 125, 131

2. Physiology Courses:
BIOL 155, 156, 157 and 157L, 160, 161, 162 and 162L; MSCI 135

3. Third Laboratory Course:
BIOL 120, 122, 123, 124, 125, 130, 131, 132, 133, 134, 135, 136, 140, 141, 142, 143, 144, 151, 152, 153, 155, 156, 157 and 157L, 160, 161, 162 and 162L, 170, 171, 172S, 174, 176, 178; MSCI 112, 113, 124, 125, 131, 135

Options for Completing the 20-unit requirement:
You may take additional laboratory courses from line 3 above, BIOL 67A or 67B, 110, 119, 121, 150, 158, 163, 164, 165, 166, 173, 175, 189T, up to 6 units of 190.

Additional requirements (30 units)
CHEM 1A, 1AL, 1B, 1BL, 8 or 128A, 129A, and 150** or 155A (18 units)
MATH 70 or 75 (4 units)
MATH 101 or PSYCH 42 (4 units)
PHYS 2A (4 units)

General Education requirements (51 units)

Electives and remaining degree requirements (6 units)
(See Degree Requirements); may be used toward a double major or minor

Total (120 units)

* See Advising Note 1.

** See Advising Note 3.

Advising Notes for B.S. in Biology

1. The total of 120 units assumes biology majors will maximize the 9 units of General Education requirements that also may be applied to major and additional required courses as follows: 3 units of CHEM 1A/1AL in G.E. Breadth B1; 3 units of BIOL 1A in G.E. Breadth B2; and 3 units of MATH 70 or 75 in G.E. Foundation B4. Consult your major academic adviser for details.
2. B.S. biology majors who have taken introductory sequences other than BIOL 1A and 1B /BL must consult with their faculty adviser or department chair for equivalency evaluation prior to beginning their upper-division coursework.
3. Please note that CHEM 128B is a prerequisite for CHEM 150 and 155A.
4. Premedical, prepharmacy, preveterinary, and preclinical laboratory sciences students are required to take CHEM 128B in addition to CHEM 128A, and PHYS 2B in addition to PHYS 2A. Prepharmacy students are required to take, and most premedical and preveterinary students should take, CHEM 129B. Preclinical laboratory sciences students are required to take CHEM 105. Some prepharmacy and premedical students should take MATH 76.
5. No BIOL courses meeting General Education Integration course requirements may be used to satisfy the General Education requirements for biology majors.
6. CR/NC grading is not permitted in the biology major.
7. General Education, additional, and elective requirements may be used toward a double major or minor (see Double Major or departmental minor). Consult the appropriate department chair, program coordinator, or faculty adviser for additional information.

Suggested Sequence of Courses for B.S. in Biology

The following comments on timing and sequence are intended for full-time students who plan to complete the B.S. in four years. Students with extensive extracurricular obligations should make appropriate timing adjustments to avoid overloads. See your adviser for assistance.

A total of 120 units must be completed for the B.S. in Biology. In addition to courses required for the major, full-time students should add General Education requirements and electives to bring semester totals to 15-17 units.

During the first two years, resident students should complete some General Education requirements, BIOL 1A and 1B/1BL, all lower-division additional requirements, and any lower-division electives that might be selected. Students are advised to keep some General Education coursework for their junior and senior years. BIOL 101, 102, 103, and statistics should be completed as early as possible and preferably no later than the end of the third year. The remainder of the third and fourth years should be spent completing requirements for the major, for General Education, and for the electives in biology and other fields. BIOL 105 must be taken after the other core courses.

FACULTY

Faculty expertise spans the range of biology from the molecular to the ecological, with a broad representation of taxonomic specialties. Laboratories in upper-division majors' courses are taught by faculty, and individualized student/faculty research participation through independent study is strongly encouraged.

Faculty members have garnered independent research funding from various agencies including the National Institutes of Health, National Science Foundation, U.S. Department of Agriculture, Environmental Protection Agency, and National Sea Grant. Faculty and students also participate in collaborative studies on, for example, medical and clinical topics with local physicians and hospitals; agricultural topics with University of California Kearney Agricultural Research and Extension Center and the U.S.D.A.-Agricultural Research Service San Joaquin Valley Agricultural Sciences Center in Fresno/Parlier; ecological

and environmental topics with California Department of Fish and Wildlife, U.S. Forest Service and Endangered Species Recovery Project; and science educational topics with regional school districts and state and national credentialing agencies.

For faculty phone numbers and e-mail, see the campus directory.

For more on the faculty, see the faculty pages.
The faculty pages are updated by the department or program.

Name	Degree	Email	Phone
Aaron, Steven M	Master of Arts	smaaron@mail.fresnostate.edu	
Abou Naoum, Michelle M	Bachelor of Arts	mabounaoum@csufresno.edu	
Adineh, Shadi	Bachelor of Science	shajiadineh@csufresno.edu	
Andrews, David M	Doctorate of Education	davidan@csufresno.edu	559.278.5174
Blumenshine, Steven C	Doctor of Philosophy	sblumens@csufresno.edu	559.278.8770
Bush, Jason A	Doctor of Philosophy	jbush@csufresno.edu	559.278.2068
Calderon-Urrea, Alejandro	Doctor of Philosophy	calalea@csufresno.edu	559.278.4080
Chooljian, Karen M	Master of Science	kachooljian@csufresno.edu	559.278.2497
Coffman, Stephanie R	Doctor of Philosophy	scoffman@csufresno.edu	
Constable, John V	Doctor of Philosophy	jconstable@csufresno.edu	559.278.2410
Constable, Julie L	Doctor of Philosophy	juconstable@csufresno.edu	559.278.2001
Costa, Justin A	Master of Science	jucosta@csufresno.edu	
Crosbie, Paul R	Doctor of Philosophy	pcrosbie@csufresno.edu	559.278.2074
Gousset, Karine	Doctor of Philosophy	kgousset@csufresno.edu	559.278.5802
Hussain, M. D			
Kern, Ruth A	Doctor of Philosophy	rakern@csufresno.edu	559.278.4075
Lent, David D	Doctor of Philosophy	dlent@csufresno.edu	559.278.3966
Lin, Joseph Y	Master of Science	jlin@csufresno.edu	
Linman, Lynn C	Master of Arts	llinman@csufresno.edu	
Mcclelland, Angela M	Master of Science	amcclelland@csufresno.edu	
Miles, Christopher R	Bachelor of Arts	cmiles@csufresno.edu	
Mitchell, Marilyn C		mamitchell@csufresno.edu	

Name	Degree	Email	Phone
Mohan, Archana V	Master of Science	amohan@csufresno.edu	
Moyle, Patrick S	Master of Education	pamoyle@csufresno.edu	
Muller, Ulrike	Doctor of Philosophy	umuller@csufresno.edu	559.278.2532
Rawat, Mamta	Doctor of Philosophy	mrawat@csufresno.edu	559.278.2003
Reece, Amber J		areece@csufresno.edu	
Reece, Joshua S	Doctor of Philosophy	joreece@csufresno.edu	
Riley, Larry G	Doctor of Philosophy	lriley@csufresno.edu	559.278.2997
Ross, Joseph A	Doctor of Philosophy	jross@csufresno.edu	559.278.4074
Shiglik, Alexander	Master of Science	ashiglik@mail.fresnostate.edu	
Strankman, Andrew W	Master of Science	astrankman@csufresno.edu	559.278.2696
Tamayo, Rachel P	Master of Science	racheltamayo@csufresno.edu	
Tsukimura, Brian K	Doctor of Philosophy	briant@csufresno.edu	559.278.4244
Van Laar, Tricia	Doctor of Philosophy	tvanlaar@csufresno.edu	
Walter, Emily M	Doctor of Philosophy	ewalter@csufresno.edu	
Waselkov, Katherine	Doctor of Philosophy	kwaselkov@csufresno.edu	
Wright, Alice	Doctor of Philosophy	awright@csufresno.edu	559.278.7692
Youn, Hwan	Doctor of Philosophy	hyoun@csufresno.edu	559.278.8305