BS IN BIOLOGICAL SCIENCE (BIOMEDICAL SCIENCES)

Units required for Major: 73-85, includes units of study in chosen concentration (see below).
Total units required for BS: 120

Program Description

The concentration in Biomedical Sciences is designed to prepare students for graduate study in the anatomical and physiological sciences or for health professional training (Medical, Veterinary, Physical Therapy, Nursing, Pharmacy, or other health professions).

Note:

- CHEM 24 and CHEM 124 are required instead of CHEM 20 for the Biomedical Sciences Concentration.
- Additional units may be required to meet the Sacramento State foreign language requirement.

Pre-Major Requirements

The Biological Sciences program at Sacramento State is one of the most highly sought after programs in Northern California. Due to the large number of applications, the program is now officially impacted. Students wishing to become Biological Science majors must complete a series of required lower division and then must apply for admission to the program. Check the department website for requirements, and it is highly recommended that interested students speak with an advisor at the Natural Sciences Advising Center (NSAC) as soon as possible.

Freshmen interested in the major are admitted as pre-Biological Science majors.

To change to the Biological Sciences major, pre-major students are required to complete the following courses and grade requirements and submit a Declaration of Major form to the Biological Science Department Office along with transcript copies.

1. Completion of the following lower division "pre-major" courses with a minimum "C" or better. Only first or second attempt will be considered:

Code	Title	Units
BIO 1	Biodiversity, Evolution and Ecology	5
BIO 2	Cells, Molecules and Genes	5
CHEM 1A	General Chemistry I	5
STAT 1	Introduction to Statistics	3
ENGL 5	Accelerated Academic Literacies [1]	3

1. Overall GPA of 2.5 based on the pre-major courses listed above.
2. Minimum of 30 units completed at the college level.

[1] Course also satisfies General Education (GE)/Graduation Requirement.

Program Requirements

Code	Title	Units
Required Lower Division Core Courses (37-41 Units)		
BIO 1	Biodiversity, Evolution and Ecology [1]	5
BIO 2	Cells, Molecules and Genes	5
CHEM 1A	General Chemistry I [1]	5
CHEM 1B	General Chemistry II	5
Select one of the following:		3 - 6
CHEM 24 & CHEM 124	Organic Chemistry Lecture I Organic Chemistry Lecture II	
Select one of the following:		3 - 4
MATH 26A	Calculus I for the Social and Life Sciences	
MATH 30	Calculus I	
PHYS 5A	General Physics: Mechanics, Heat, Sound	4
PHYS 5B	General Physics: Light, Electricity and Magnetism, Modern Physics	4
STAT 1	Introduction to Statistics [1]	3
Required Upper Division Core Courses (7 Units)		
BIO 100	Introduction to Scientific Analysis	3
BIO 184	General Genetics	4
Concentration (29-37 Units)		
Select from the following concentrations:		29 - 37
General Biology		
Biomedical Sciences		
Cell and Molecular Biology		
Clinical Laboratory Sciences		
Ecology, Evolution, and Conservation		
Forensic Biology		
Microbiology		
Total Units		**73-85**

[1] Course also satisfies General Education (GE)/Graduation Requirement.
[2] CHEM 24 and CHEM 124 may be taken in lieu of CHEM 20. (CHEM 124 is not counted toward the 36 upper division unit requirement in the major except in the Biomedical Sciences Concentration.)

Notes:

- Pre-Health Professional students should take the Chemistry and Math requirements as stated in the Pre-Health Professional Program section of this catalog.
- With approval, up to six units of upper division coursework from related fields may be applied as electives in the major.
- No more than 3 units from the following combined can be applied to the Biological Sciences upper division major requirement. No more than 2 units from BIO 195 and 197 series courses can be used toward this requirement.

Code	Title	Units
BIO 195	Biological Internship	1 - 2
BIO 197A	Laboratory Teaching Assistant	1 - 2
BIO 197B	Laboratory Techniques	1 - 2

BIO 197C	Co-curricular Activities in Biology	1 - 2
BIO 199A	Introductory Undergraduate Research	1 - 2
BIO 199B	Directed Readings	1 - 2

Concentration in Biomedical Sciences (33 units)

Code	Title	Units
Required Courses (21 Units)		
BIO 22	Introductory Human Anatomy	4
BIO 121	Molecular Cell Biology	3
BIO 131	Systemic Physiology	4
BIO 139	General Microbiology	4
CHEM 25	Organic Chemistry Laboratory	3
CHEM 161	General Biochemistry	3
Elective Courses (12 Units)		
Select one of the following Structure and Function electives:		3
BIO 104	Physiology of Human Reproduction	
BIO 122	Advanced Human Anatomy	
BIO 123	Neuroanatomy	
BIO 126	Comparative Vertebrate Morphology	
BIO 127	Developmental Biology	
BIO 128	Plant Anatomy and Physiology	
BIO 130	Histology	
BIO 132	Neurophysiology	
BIO 133	Cardiovascular, Respiratory and Renal Physiology	
Select one of the following Ecology, Evolution, and Biodiversity electives:		3
Part A: Biodiversity Electives		
BIO 103	Plants and Civilization	
BIO 112	Plant Taxonomy	
BIO 140	Medical Microbiology and Emerging Infectious Diseases	
BIO 145	The Diversity of Microorganisms	
BIO 152	Human Parasitology	
BIO 157	General Entomology	
BIO 162	Ichthyology: The Study of Fishes	
BIO 164	Amphibians and Reptiles: An Introduction to Herpetology	
BIO 166	Ornithology	
BIO 168	Mammalogy	
Part B: Ecology and Evolution Electives		
BIO 113	Evolution and Speciation in Flowering Plants	
BIO 118	Natural Resource Conservation	
BIO 160	General Ecology	
BIO 169	Animal Behavior	
BIO 173	Principles of Fisheries Biology	
BIO 179	Conservation Biology & Wildlife Management	
BIO 188	Evolution	
Select additional electives in consultation with an advisor to total 12 upper division elective units		6
Total Units		**33**

Note: Students in Biomedical Sciences concentration must take CHEM 24 and CHEM 124 instead of CHEM 20.

General Education Requirements [1]

Code	Title	Units
Area A: Basic Subjects (6 Units)		
A1 - Oral Communication		3
A2 - Written Communication [2]		0
A3 - Critical Thinking		3
Area B: Physical Universe and Its Life Forms		
B1 - Physical Science [2]		0
B2 - Life Forms [2]		0
B3 - Lab (Note: Lab experience to be taken with one of the following: B1, B2 or B5) [2]		0
B4 - Math Concepts [2]		0
B5 - Additional Course (Any B to reach 12 units) - Take upper-division course to complete Area & upper division requirements. [2]		0
Area C: Arts and Humanities (12 Units)		
C1 - Arts		3
C2 - Humanities		3
C1/C2 - Area C Course		3
C1/C2 - Area C Course - Take upper-division course to complete Area & upper division requirements.		3
Area D: The Individual and Society (9 Units)		
Area D Course		3
Area D Course		3
Area D Course - Take upper-division course to complete Area & upper division requirements.		3
Area E: Understanding Personal Development (3 Units)		
Area E Course		3
Area F: Ethnic Studies (3 Units)		
Area F Course		3
Total Units		**33**

[1] To help you complete your degree in a timely manner and not take more units than absolutely necessary, there are ways to use single courses to meet more than one requirement (overlap). For further information, please visit the General Education page (https://catalog.csus.edu/colleges/academic-affairs/general-education/).
Note: There is no way to list all possible overlaps so please consult with a professional advisor. The Academic Advising Center can be visited online (http://www.csus.edu/acad), by phone (916) 278-1000, or email (advising@csus.edu).

[2] Required in Major; also satisfies GE.

Graduation Requirements [1]

Code	Title	Units
Graduation Requirements (required by CSU) (9 Units)		
American Institutions: U.S. History		3
American Institutions: U.S. Constitution & CA Government		3
Writing Intensive (WI)		3

Graduation Requirements (required by Sacramento State) (12 Units)	
English Composition II	3
Race and Ethnicity in American Society (RE)	3
Foreign Language Proficiency Requirement [2]	6

[1] To help you complete your degree in a timely manner and not take more units than absolutely necessary, there are ways to use single courses to meet more than one requirement (overlap). For further information, please visit the General Education page (https://catalog.csus.edu/colleges/academic-affairs/general-education/).
Note: There is no way to list all possible overlaps so please consult with a professional advisor. The Academic Advising Center can be visited online (http://www.csus.edu/acad), by phone (916) 278-1000, or email (advising@csus.edu).

[2] If not satisfied before entering Sacramento State, it may be satisfied in General Education Area C2 (Humanities). "C- or better required." The alternative methods for satisfying the Foreign Language Proficiency Requirement are described here: https://www.csus.edu/college/arts-letters/world-languages-literatures/foreign-language-requirement.html (https://www.csus.edu/college/arts-letters/world-languages-literatures/foreign-language-requirement.html)

The following roadmaps are sample planning resources. Please consult your academic advisor and Academic Catalog for graduation requirements as you develop your individualized academic plan.

Biological Science (Biomedical Sciences), BS: 4-Year Roadmap

Course	Title	Units
Year 1		
First Semester		
MATH 26A or MATH 30	Calculus I for the Social and Life Sciences [3] or Calculus I	3 - 4
GE Area 1A - English Composition [2]		3
GE Area 1C - Oral Communication [2]		3
GE Area 6 - Ethnic Studies [2]		3
GE Area 4 - Social & Behavioral Sciences [2]		3
	Units	**15-16**
Second Semester		
CHEM 1A	General Chemistry I	5
STAT 1	Introduction to Statistics	3
GE Area 1B - Critical Thinking [2]		3
Elective of Choice		3
	Units	**14**
Year 2		
First Semester		
BIO 1	Biodiversity, Evolution and Ecology	5
CHEM 1B	General Chemistry II	5
GE Area 3A - Arts [2]		3
	Units	**13**
Second Semester		
BIO 2	Cells, Molecules and Genes	5
CHEM 24	Organic Chemistry Lecture I	3
GE Area 3B - Humanities [2]		3
Upper Division GE Area 4 - Social & Behavioral Sciences + American Institutions (GOVT) [2]		3
Second Semester Composition [2]		3
	Units	**17**
Year 3		
First Semester		
BIO 100	Introduction to Scientific Analysis	3
BIO 184	General Genetics	4
CHEM 124	Organic Chemistry Lecture II	3
PHYS 5A	General Physics: Mechanics, Heat, Sound	4
GR American Institutions (US History) [2]		3
	Units	**17**
Second Semester		
BIO 121	Molecular Cell Biology	3
BIO 131	Systemic Physiology	4
CHEM 25	Organic Chemistry Laboratory	3
PHYS 5B	General Physics: Light, Electricity and Magnetism, Modern Physics	4
	Units	**14**
Year 4		
First Semester		
BIO 22	Introductory Human Anatomy	4
CHEM 161	General Biochemistry	3
Biomedical Sciences Elective [3]		3
Structure and Function Elective [3]		3
Foreign Language Semester 1 [2]		4
	Units	**17**
Second Semester		
BIO 139	General Microbiology	4
Biomedical Sciences Elective [3]		3
Ecology, Evolution, and Biodiversity Elective [3]		3
Upper Division GE Area 3 - Arts or Humanities + Writing Intensive [2]		3
Foreign Language Semester 2 [2]		4
	Units	**17**
	Total Units	**124-125**

Biological Science (Biomedical Sciences), BS: 2-Year Roadmap

Course	Title	Units
Year 1		
First Semester		
BIO 100	Introduction to Scientific Analysis	3
BIO 184	General Genetics	4
CHEM 124	Organic Chemistry Lecture II	3
Foreign Language Semester 1 [2]		4
	Units	**14**
Second Semester		
BIO 131	Systemic Physiology	4
Biomedical Sciences Elective [3]		3
GR American Institutions (US History) [2]		3
Foreign Language Semester 2 [2]		4
Elective of Choice		3
	Units	**17**
Year 2		
First Semester		
BIO 121	Molecular Cell Biology	3
CHEM 161	General Biochemistry	3
Structure and Function Elective [3]		3
Upper Division GE Area 4 - Social & Behavioral Sciences [2]		3
Elective of Choice		3
	Units	**15**

Second Semester		
BIO 139	General Microbiology	4
Biomedical Sciences Elective [3]		3
Ecology, Evolution, and Biodiversity Elective [3]		3
Upper Division GE Area 3 - Arts or Humanities + Writing Intensive [2]		3
GR American Institutions (GOVT) [2]		3
	Units	**16**
	Total Units	**62**

1. Any course not completed in the first semester should be taken in the second or a later semester.
2. Please see General Education/Graduation Requirement **course options (https://www.csus.edu/academic-affairs/curriculum-%20workflow/_internal/_documents/program-road-maps/als_2yr/art_transfer-%20roadmap-2024-25.pdf)**.
3. Please see an academic advisor for elective options.