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:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 1</td>
<td>Biodiversity, Evolution and Ecology</td>
<td>5</td>
</tr>
<tr>
<td>BIO 2</td>
<td>Cells, Molecules and Genes</td>
<td>5</td>
</tr>
<tr>
<td>CHEM 1A</td>
<td>General Chemistry I</td>
<td>5</td>
</tr>
<tr>
<td>STAT 1</td>
<td>Introduction to Statistics</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 5</td>
<td>Accelerated Academic Literacies</td>
<td>3</td>
</tr>
</tbody>
</table>

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

Program Requirements

Required Lower Division Core Courses (37-41 Units)

<table>
<thead>
<tr>
<th>Code</th>
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</tr>
</thead>
<tbody>
<tr>
<td>BIO 1</td>
<td>Biodiversity, Evolution and Ecology</td>
<td>5</td>
</tr>
<tr>
<td>BIO 2</td>
<td>Cells, Molecules and Genes</td>
<td>5</td>
</tr>
<tr>
<td>CHEM 1A</td>
<td>General Chemistry I</td>
<td>5</td>
</tr>
<tr>
<td>CHEM 1B</td>
<td>General Chemistry II</td>
<td>5</td>
</tr>
</tbody>
</table>

Select one of the following: 3 - 6

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 24 &amp; CHEM 124</td>
<td>Organic Chemistry Lecture I &amp; Organic Chemistry Lecture II</td>
<td>6</td>
</tr>
</tbody>
</table>

Required Upper Division Core Courses (7 Units)

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 100</td>
<td>Introduction to Scientific Analysis</td>
<td>3</td>
</tr>
<tr>
<td>BIO 184</td>
<td>General Genetics</td>
<td>4</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 195</td>
<td>Biological Internship</td>
<td>1</td>
</tr>
</tbody>
</table>


### Concentration in Biomedical Sciences (33 units)

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 22</td>
<td>Introductory Human Anatomy</td>
<td>4</td>
</tr>
<tr>
<td>BIO 121</td>
<td>Molecular Cell Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 131</td>
<td>Systemic Physiology</td>
<td>4</td>
</tr>
<tr>
<td>BIO 139</td>
<td>General Microbiology</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 25</td>
<td>Organic Chemistry Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 161</td>
<td>General Biochemistry</td>
<td>3</td>
</tr>
</tbody>
</table>

#### Elective Courses (12 Units)

Select one of the following Structure and Function electives:

- 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:

**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

Select additional electives in consultation with an advisor to total 12 upper-division elective units

**Total Units** 33

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

### General Education Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
</table>

#### Area A: Basic Subjects (6 Units)

- A1 - Oral Communication 3
- A2 - Written Communication 0
- A3 - Critical Thinking 3

#### Area B: Physical Universe and Its Life Forms

- B1 - Physical Science 2
- B2 - Life Forms 2
- B3 - Lab (Note: Lab experience to be taken with one of the following: B1, B2 or B5) 0
- B4 - Math Concepts 2
- B5 - Additional Course (Any B to reach 12 units) - Take upper-division course to complete Area & upper division requirements. 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.

#### 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.

#### 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 (http://catalog.csus.edu/colleges/academic-affairs/general-education/).

2. Required in Major; also satisfies GE.

### Graduation Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
</table>

#### Graduation Requirements (required by CSU) (9 Units)

- American Institutions: U.S. History 3
- American Institutions: U.S. Constitution & CA Government 3
<table>
<thead>
<tr>
<th>Requirement</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Writing Intensive (WI)</td>
<td>3</td>
</tr>
<tr>
<td><strong>Graduation Requirements (required by Sacramento State) (12 Units)</strong></td>
<td></td>
</tr>
<tr>
<td>English Composition II</td>
<td>3</td>
</tr>
<tr>
<td>Race and Ethnicity in American Society (RE)</td>
<td>3</td>
</tr>
<tr>
<td>Foreign Language Proficiency Requirement</td>
<td>6</td>
</tr>
</tbody>
</table>

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 (http://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