**BS MICROBIOLOGY**

**Program Learning Objectives**
1. Students will demonstrate a writing style appropriate for communicating scientific results to a diverse audience.
2. Students will integrate math, physical sciences and technology to answer biological questions using the scientific method.
3. Students will demonstrate proficiency of lab and field techniques in their area of specialization.
4. Students will master and retain fundamental concepts in biology (atom to ecosystem).
5. Students will demonstrate the skill to assess and analyze data with objectivity.
6. Students will demonstrate proficiency in searching, reading and evaluating the scientific literature.

**Degree Requirements and Curriculum**

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (http://catalog.calpoly.edu/ generalrequirementsbachelorsdegree/#generaleducationtext) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major, support, or concentration courses may be selected as credit/no credit.

**MAJOR COURSES**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 160</td>
<td>Diversity and History of Life</td>
<td>4</td>
</tr>
<tr>
<td>BIO 161</td>
<td>Introduction to Cell and Molecular Biology (B2&amp;B4)</td>
<td>4</td>
</tr>
<tr>
<td>BIO 263</td>
<td>Introductory Ecology and Evolution</td>
<td>4</td>
</tr>
<tr>
<td>BIO 351</td>
<td>Principles of Genetics</td>
<td>5</td>
</tr>
<tr>
<td>BIO 426</td>
<td>Immunology</td>
<td>4</td>
</tr>
<tr>
<td>BIO 452</td>
<td>Cell Biology</td>
<td>4</td>
</tr>
<tr>
<td>MCRO 224</td>
<td>General Microbiology I</td>
<td>5</td>
</tr>
<tr>
<td>MCRO 225</td>
<td>General Microbiology II</td>
<td>5</td>
</tr>
<tr>
<td>MCRO 402</td>
<td>General Virology</td>
<td>4</td>
</tr>
<tr>
<td>MCRO 423</td>
<td>Medical Microbiology</td>
<td>5</td>
</tr>
<tr>
<td>MCRO 424</td>
<td>Microbial Physiology</td>
<td>5</td>
</tr>
<tr>
<td>BIO 461</td>
<td>Senior Project - Research Proposal</td>
<td>2</td>
</tr>
<tr>
<td>or BIO 462</td>
<td>Senior Project - Research</td>
<td></td>
</tr>
</tbody>
</table>

**Electives**

Select from the following: 1,2,3,5 19

**Biotechnology**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCRO 433</td>
<td>Microbial Biotechnology</td>
</tr>
<tr>
<td>ASCI 403</td>
<td>Applied Biotechnology in Animal Science</td>
</tr>
<tr>
<td>BIO 202</td>
<td>Orientation to Biotechnology</td>
</tr>
<tr>
<td>BIO/CHEM 441</td>
<td>Bioinformatics Applications</td>
</tr>
</tbody>
</table>

**Food Microbiology**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCRO 301</td>
<td>Wine Microbiology</td>
</tr>
<tr>
<td>MCRO 421</td>
<td>Food Microbiology</td>
</tr>
<tr>
<td>DSCI 402</td>
<td>Quality Assurance and Control of Dairy Products</td>
</tr>
<tr>
<td>DSCI 434</td>
<td>Cheese and Fermented Dairy Foods</td>
</tr>
<tr>
<td>DSCI 444</td>
<td>Dairy Microbiology</td>
</tr>
<tr>
<td>FSN 230</td>
<td>Elements of Food Processing</td>
</tr>
<tr>
<td>FSN 275</td>
<td>Elements of Food Safety</td>
</tr>
<tr>
<td>FSN 335</td>
<td>Food Quality Assurance</td>
</tr>
<tr>
<td>FSN 341</td>
<td>Fermented Foods</td>
</tr>
<tr>
<td>FSN 364</td>
<td>Food Chemistry</td>
</tr>
<tr>
<td>FSN 368</td>
<td>Food Analysis</td>
</tr>
<tr>
<td>FSN 374</td>
<td>Food Laws and Regulations</td>
</tr>
<tr>
<td>FSN 474</td>
<td>Advanced Food Processing</td>
</tr>
</tbody>
</table>

**Medical and Public Health Microbiology**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCRO 320</td>
<td>Emerging Infectious Diseases</td>
</tr>
<tr>
<td>MCRO 342</td>
<td>Public Health Microbiology</td>
</tr>
<tr>
<td>ASCI 203</td>
<td>Animal Parasitology</td>
</tr>
<tr>
<td>ASCI 312</td>
<td>Production Medicine</td>
</tr>
<tr>
<td>ASCI 321</td>
<td>Zoonoses and Veterinary Public Health Concerns</td>
</tr>
<tr>
<td>ASCI 438</td>
<td>Systemic Animal Physiology</td>
</tr>
<tr>
<td>ASCI 440</td>
<td>Immunology and Diseases of Animals</td>
</tr>
<tr>
<td>BIO 162</td>
<td>Introduction to Organismal Form and Function</td>
</tr>
<tr>
<td>BIO 406</td>
<td>Advanced Anatomy and Physiology: Neuroscience</td>
</tr>
<tr>
<td>BIO 407</td>
<td>Advanced Anatomy and Physiology: Endocrinology</td>
</tr>
<tr>
<td>BIO 408</td>
<td>Advanced Anatomy and Physiology: Cardiorespiratory and Renal</td>
</tr>
<tr>
<td>BIO 409</td>
<td>Advanced Anatomy and Physiology: Muscle and Locomotion</td>
</tr>
<tr>
<td>BIO 410</td>
<td>Functional Histology</td>
</tr>
<tr>
<td>BIO 428</td>
<td>Hematology</td>
</tr>
<tr>
<td>BIO 429</td>
<td>Parasitology</td>
</tr>
<tr>
<td>CHEM 331</td>
<td>Quantitative Analysis</td>
</tr>
<tr>
<td>CHEM 349</td>
<td>Chemical and Biological Warfare</td>
</tr>
<tr>
<td>CHEM 377</td>
<td>Chemistry of Drugs and Poisons</td>
</tr>
<tr>
<td>CHEM 477</td>
<td>Biochemical Pharmacology</td>
</tr>
<tr>
<td>KINE 301</td>
<td>Functional Anatomy</td>
</tr>
</tbody>
</table>

**Microbial Ecology and Evolution**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCRO 436</td>
<td>Microbial Ecology</td>
</tr>
<tr>
<td>BIO 414</td>
<td>Evolution</td>
</tr>
</tbody>
</table>
### BS Microbiology

- **CHEM 341**: Environmental Chemistry: Water Pollution
- **ENVE 434**: Water Chemistry and Water Quality Measurements
- **SS 422**: Soil Ecology

#### Other electives for Microbiology Majors
- **AEPS 313**: Agricultural Entomology
- **AEPS/BOT 323**: Plant Pathology
- **AEPS 441**: Biological Control for Pest Management
- **BIO 335**: General Entomology
- **BIO 336**: Invertebrate Zoology
- **BIO 361**: Principles of Animal Physiology
- **BIO 400**: Special Problems for Advanced Undergraduates
- **BIO 434**: Environmental Physiology
- **BIO 450**: Undergraduate Laboratory Assistantship
- **BIO 462**: Senior Project - Research
- **BIO 463**: Honors Research
- **CHEM 218 & CHEM 223**: Organic Chemistry III and Organic Chemistry Laboratory for Life Sciences III
- **CHEM 418**: Neurochemistry
- **CHEM 419**: Bioorganic Chemistry
- **CHEM 127**: General Chemistry for Agriculture and Life Science I (B3&B4) 4
- **CHEM 128**: General Chemistry for Agriculture and Life Science II 4
- **CHEM 129**: General Chemistry for Agriculture and Life Science III 4
- **CHEM 216**: Organic Chemistry I 3 5
- **CHEM 217 & CHEM 220**: Organic Chemistry II and Organic Chemistry Laboratory For Life Sciences II 5
- **CHEM 313**: Survey of Biochemistry and Biotechnology 4
- **CHEM 371**: Biochemical Principles
- **MATH 162**: Calculus for the Life Sciences II 4
- **MCRO 100**: Introduction to Microbiology Research
- **SCM 451**: Ethics in the Sciences
- **STAT 313**: Applied Experimental Design and Regression Models
- **STAT 419**: Applied Multivariate Statistics
- **STAT 421**: Survey Sampling and Methodology

#### SUPPORT COURSES

- **CHEM 127**: General Chemistry for Agriculture and Life Science I (B3&B4) 4
- **CHEM 128**: General Chemistry for Agriculture and Life Science II 4
- **CHEM 129**: General Chemistry for Agriculture and Life Science III 4
- **CHEM 216**: Organic Chemistry I 3 5
- **CHEM 217 & CHEM 220**: Organic Chemistry II and Organic Chemistry Laboratory For Life Sciences II 5
- **CHEM 313**: Survey of Biochemistry and Biotechnology 4
- **or CHEM 371**: Biochemical Principles
- **MATH 162**: Calculus for the Life Sciences I (B1) 3 4
- **PHYS 121**: College Physics I 4
- **PHYS 122**: College Physics II 4
- **PHYS 123**: College Physics III 4
- **STAT 218**: Applied Statistics for the Life Sciences (B1) 4

#### GENERAL EDUCATION (GE)

(See list of GE program requirements below.) 56

#### FREE ELECTIVES

Free Electives 8

Total units 180

1. Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.
2. Limited to a total of 4 units from BIO 400, BIO 450, BIO 462, and BIO 463. At least 14 units must be upper division (300-400 level).
3. Students planning to attend graduate or professional schools are strongly advised to meet with their advisors to ensure that they meet necessary prerequisites for entry into these programs. Additional courses in math and chemistry may be necessary.
4. CHEM 371 suggested for students who plan to pursue graduate school or a health professions career.
5. Care must be taken to ensure compliance with the "60 units of upper-division" requirement.
6. If BIO 462 is used to meet the Senior Project Requirement, it cannot also be counted as an Approved Elective.

### General Education (GE) Requirements

- 72 units required, 16 of which are specified in Major and/or Support.
- See the complete GE course listing (http://catalog.calpoly.edu/generalrequirementsbachelorsdegree/#generaleducationtext).
- Minimum of 12 units required at the 300 level.

#### Area A: Communication

<table>
<thead>
<tr>
<th>Area A</th>
<th>Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>Expository Writing</td>
</tr>
<tr>
<td>A2</td>
<td>Oral Communication</td>
</tr>
<tr>
<td>A3</td>
<td>Reasoning, Argumentation and Writing</td>
</tr>
</tbody>
</table>

#### Area B: Science and Mathematics

<table>
<thead>
<tr>
<th>Area B</th>
<th>Science and Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>Mathematics/Statistics (8 units in Support)</td>
</tr>
<tr>
<td>B2</td>
<td>Life Science (4 units in Major)</td>
</tr>
<tr>
<td>B3</td>
<td>Physical Science (4 units in Support)</td>
</tr>
<tr>
<td>B4</td>
<td>One lab taken with either a B2 or B3 course</td>
</tr>
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</table>

#### Area C: Arts and Humanities

<table>
<thead>
<tr>
<th>Area C</th>
<th>Arts and Humanities</th>
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</thead>
<tbody>
<tr>
<td>C1</td>
<td>Literature</td>
</tr>
<tr>
<td>C2</td>
<td>Philosophy</td>
</tr>
<tr>
<td>C3</td>
<td>Fine/Performing Arts</td>
</tr>
<tr>
<td>C4</td>
<td>Upper-division elective</td>
</tr>
<tr>
<td>Area C elective</td>
<td>(Choose one course from C1-C5)</td>
</tr>
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</table>

#### Area D/E: Society and the Individual

<table>
<thead>
<tr>
<th>Area D/E</th>
<th>Society and the Individual</th>
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</thead>
<tbody>
<tr>
<td>D1</td>
<td>The American Experience (Title 5, Section 40404 requirement)</td>
</tr>
<tr>
<td>D2</td>
<td>Political Economy</td>
</tr>
<tr>
<td>D3</td>
<td>Comparative Social Institutions</td>
</tr>
<tr>
<td>D4</td>
<td>Self Development (CSU Area E)</td>
</tr>
<tr>
<td>D5</td>
<td>Upper-division elective</td>
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</table>

#### Area F: Technology

<table>
<thead>
<tr>
<th>Area F</th>
<th>Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirement</td>
<td>Units</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Upper-division elective</td>
<td>4</td>
</tr>
<tr>
<td>Total units</td>
<td>56</td>
</tr>
</tbody>
</table>

1 required in Major/Support; also satisfies GE.