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>
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<tr>
<td>BIO 161</td>
<td>Introduction to Cell and Molecular Biology (B2&amp;B4)</td>
<td>7</td>
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<tr>
<td>BIO 263</td>
<td>Introductory Ecology and Evolution</td>
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<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>
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<tr>
<td>MCRO 224</td>
<td>General Microbiology I</td>
<td>5</td>
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<tr>
<td>MCRO 225</td>
<td>General Microbiology II</td>
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</tr>
<tr>
<td>MCRO 402</td>
<td>General Virology</td>
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<td>MCRO 423</td>
<td>Medical Microbiology</td>
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<tr>
<td>MCRO 424</td>
<td>Microbial Physiology</td>
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<tr>
<td>BIO 461</td>
<td>Senior Project - Research Proposal</td>
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<tr>
<td>or BIO 462</td>
<td>Senior Project Research Experience</td>
<td></td>
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</tbody>
</table>

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

Biotechnology
- ASCI 403 Applied Biotechnology in Animal Science
- BIO 202 Orientation to Biotechnology
- BIO/CHEM 441 Bioinformatics Applications
- BIO/CHEM 475 Molecular Biology Laboratory

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<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>BIO/CHEM 476</td>
<td>Gene Expression Laboratory</td>
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<tr>
<td>BRAE 448</td>
<td>Bioconversion</td>
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<tr>
<td>CHEM 331</td>
<td>Quantitative Analysis</td>
</tr>
<tr>
<td>CHEM 372</td>
<td>Metabolism</td>
</tr>
<tr>
<td>CHEM 373</td>
<td>Molecular Biology</td>
</tr>
<tr>
<td>CHEM 474</td>
<td>Protein Techniques Laboratory</td>
</tr>
<tr>
<td>MCRO 433</td>
<td>Microbial Biotechnology</td>
</tr>
</tbody>
</table>

Food Microbiology
- DSCI 402 Quality Assurance and Control of Dairy Products
- DSCI 434 Cheese and Fermented Dairy Foods
- DSCI 444 Dairy Microbiology
- FSN 230 Elements of Food Processing
- FSN 275 Elements of Food Safety
- FSN 335 Food Quality Assurance
- FSN 341 Fermented Foods
- FSN 364 Food Chemistry
- FSN 368 Food Analysis
- FSN 374 Food Laws and Regulations
- FSN 474 Advanced Food Processing
- MCRO/WVIT 301 Wine Microbiology
- MCRO 421 Food Microbiology

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

Microbial Ecology and Evolution
- BIO 413 Evolutionary Medicine
- BIO 414 Evolution
CHEM 341 Environmental Chemistry: Water Pollution
ENVE 434 Water Chemistry and Water Quality Measurements
MCRO 436 Microbial Ecology
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 300 Research Experience for Undergraduates
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 Experience
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
CSC 101 Fundamentals of Computer Science
DATA 301 Introduction to Data Science
MATH 162 Calculus for the Life Sciences II
MCRO 100 Introduction to Microbiology Research
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) 7
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 3 4
CHEM 313 Survey of Biochemistry and Biotechnology 5
CHEM 371 Biochemical Principles
MATH 161 Calculus for the Life Sciences I (B1) 3 7
PHYS 123 College Physics III 4
STAT 218 Applied Statistics for the Life Sciences (B1) 7

GENERAL EDUCATION (GE)
(See list of GE program requirements below.) 56

FREE ELECTIVES
Free Electives 5
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 300, BIO 400, BIO 450. 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.
7 Required in Major/Support; also satisfies GE.

General Education (GE) Requirements

Area A Communication
A1 Expository Writing 4
A2 Oral Communication 4
A3 Reasoning, Argumentation and Writing 4

Area B Math, Science, and Quantitative Reasoning
B1 Mathematics/Statistics (8 units in Support) 1
B2 Life Science (4 units in Major) 1
B3 Physical Science (4 units in Support) 1
B4 One lab taken with either a B2 or B3 course
B7 Upper-division elective 4

Area C Arts and Humanities
C1 Literature 4
C2 Philosophy 4
C3 Fine/Performing Arts 4
C4 Upper-division elective 4
Area C elective (Choose one course from C1-C5) 4

Area D Society and the Individual
<table>
<thead>
<tr>
<th></th>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
<td>D1</td>
<td>The American Experience (Title 5, Section 40404 requirement)</td>
<td>4</td>
</tr>
<tr>
<td>D2</td>
<td>Political Economy</td>
<td>4</td>
</tr>
<tr>
<td>D3</td>
<td>Comparative Social Institutions</td>
<td>4</td>
</tr>
<tr>
<td>D5</td>
<td>Upper-division elective</td>
<td>4</td>
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<tr>
<td><strong>Area E</strong></td>
<td>Lifelong Learning and Self-Development</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>Lower-division elective</td>
<td>4</td>
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<tr>
<td></td>
<td><strong>Total units</strong></td>
<td>56</td>
</tr>
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</table>

1 Required in Major/Support; also satisfies GE.