### 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 Code</th>
<th>Course 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 or BIO 462</td>
<td>2</td>
</tr>
</tbody>
</table>

**Electives**

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

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

#### Biotechnology

- BIO/CHEM 475 Molecular Biology Laboratory
- BIO/CHEM 476 Gene Expression Laboratory
- BRAE 448 Bioconversion
- CHEM 331 Quantitative Analysis
- CHEM 372 Metabolism
- CHEM 373 Molecular Biology
- CHEM 474 Protein Techniques Laboratory

#### Food Microbiology

- MCRO/WVIT 301 Wine Microbiology
- MCRO 421 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

#### Medical and Public Health Microbiology

- MCRO 320 Emerging Infectious Diseases
- MCRO 342 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: Cardiorespiratory 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

#### Microbial Ecology and Evolution

- MCRO 436 Microbial Ecology
- BIO 414 Evolution
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  Organic Chemistry III
& CHEM 223  Organic Chemistry Laboratory for Life Sciences III
CHEM 418  Neurochemistry
CHEM 419  Bioorganic Chemistry
MATH 162  Calculus for the Life Sciences II
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)
CHEM 128  General Chemistry for Agriculture and Life Science II
CHEM 129  General Chemistry for Agriculture and Life Science III
CHEM 216  Organic Chemistry I
& CHEM 220  Organic Chemistry Laboratory For Life Sciences II
CHEM 313  Survey of Biochemistry and Biotechnology
or CHEM 371  Biochemical Principles
MATH 161  Calculus for the Life Sciences I (B1)
PHYS 121  College Physics I
PHYS 122  College Physics II
PHYS 123  College Physics III
STAT 218  Applied Statistics for the Life Sciences (B1)

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

Area B  Science and Mathematics
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

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/E  Society and the Individual
D1  The American Experience (Title 5, Section 40404 requirement) 4
D2  Political Economy 4
D3  Comparative Social Institutions 4
D4  Self Development (CSU Area E) 4
D5  Upper-division elective 4

Area F  Technology
<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<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.