M I C R O B I O L O G Y  B S

More Information

Advising Requirement
Advising is mandatory for this program. Consult your department advisor or program coordinator for information.

E-advising Tools
Students are encouraged to use the interactive e-advising tools that have been designed to help them graduate within four years. These tools can be accessed through the Student Center.

The Bachelor of Science in Microbiology offers two options, the option in general microbiology or clinical laboratory science. The general microbiology option is designed to prepare students for careers in biotechnology, environmental or industrial microbiology, pharmaceutical and biomedical research, or graduate studies. The clinical laboratory science option prepares students for an internship to become a clinical laboratory scientist or public health microbiologist.

Student Learning Outcomes
All candidates for the BS in microbiology will demonstrate mastery in the following Student Learning Outcomes:

1. Students can demonstrate knowledge of cell structure and metabolism.
2. Students can demonstrate knowledge of evolutionary forces and their consequences.
3. Students can demonstrate knowledge as to how microorganisms interact with their environment.
4. Students can demonstrate knowledge of the interaction between humans and microorganisms.
5. Students can describe and use new and existing methods and technologies in and out of the laboratory setting.
6. Students can formally communicate the results of biological investigations using both oral and written communication skills.
7. Students can demonstrate an understanding, and ability to use, the scientific method including observation, hypotheses testing, data collection, and analysis.

Grading Requirement
All courses taken to fulfill program course requirements must be taken for a letter grade except those courses specified by the department as credit/no credit grading only.

Course Requirements for the Major: 78 units
Completion of the following courses, or their approved transfer equivalents, is required of all candidates for this degree. Courses in this program may complete more than one graduation requirement.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 109</td>
<td>The Biological University Experience</td>
<td>1</td>
</tr>
<tr>
<td>BIOL 161</td>
<td>Principles of Ecological, Evolutionary, and Organismal Biology</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 162</td>
<td>Principles of Cellular and Molecular Biology</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 163</td>
<td>Principles of Physiology and Development</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 111</td>
<td>General Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 112</td>
<td>General Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 270</td>
<td>Organic Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>ENVL 105W</td>
<td>Environmental Literacy (W)</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 202A</td>
<td>General Physics I</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 202B</td>
<td>General Physics II</td>
<td>4</td>
</tr>
</tbody>
</table>

Select four units from the following:
- MATH 105 Introduction to Statistics
- & MATH 130 and Introduction to R
- MATH 109 Survey of Calculus (may be substituted for the above two courses)
- MATH 120 Analytic Geometry and Calculus (may be substituted for the above two courses)

Upper Division
- BIOL 360 Genetics                                          4
- BIOL 371W Microbiology (W)                                 4
- CHEM 370 Organic Chemistry II                             3
- CHEM 370L Organic Chemistry Laboratory                     1
- CHEM 451 Biochemistry I                                    3
- CHEM 453L Biochemistry Laboratory                          1

Select one of the following options:
- Clinical Laboratory Science (p. 1)
- General Microbiology (p. 1)

Total Units 78

1 MATH 105 and MATH 130 are recommended for most students. Students who need calculus may take MATH 109 or MATH 120.
2 Microbiology majors are expected to have completed BIOL 109, BIOL 161, BIOL 162, BIOL 163, CHEM 111, and CHEM 112 before beginning their upper-division requirements.

Major Option Course Requirements
Students must select one of the following options for completion of the major course requirements.

The Option in Clinical Laboratory Science: 22 units

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 462</td>
<td>Hematology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 466</td>
<td>Immunology</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 470W</td>
<td>Medical Bacteriology (W)</td>
<td>5</td>
</tr>
<tr>
<td>CHEM 320</td>
<td>Quantitative Analysis</td>
<td>4</td>
</tr>
</tbody>
</table>

Select six units from the following:
- BIOL 399 Special Problems (a maximum of 3 units may be applied to the major)
- Any 400-level biology (BIOL) courses.

Total Units 22

The Option in General Microbiology: 22 units

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 402</td>
<td>Microbial Ecology</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 412W</td>
<td>Bacterial Physiology (W)</td>
<td>4</td>
</tr>
</tbody>
</table>

Select 14 units from the following selections

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 399</td>
<td>Special Problems (a maximum of 3 units may be applied to the major)</td>
<td>6</td>
</tr>
<tr>
<td>BIOL 402</td>
<td>Microbial Ecology</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 412W</td>
<td>Bacterial Physiology (W)</td>
<td>4</td>
</tr>
</tbody>
</table>

Total Units 14
Honors in the Major

Honors in the Major is a program of independent work in your major. It requires 6 units of honors course work completed over two semesters.

The Honors in the Major program allows you to work closely with a faculty mentor in your area of interest on an original performance or research project. This year-long collaboration allows you to work in your field at a professional level and culminates in a public presentation of your work. Students sometimes take their projects beyond the University for submission in professional journals, presentation at conferences, or academic competition. Such experience is valuable for graduate school and professional life. Your honors work will be recognized at your graduation, on your permanent transcripts, and on your diploma. It is often accompanied by letters of commendation from your mentor in the department or the department chair.

Some common features of Honors in the Major program are:

- You must take 6 units of Honors in the Major course work. All 6 units are honors classes (marked by a suffix of H), and at least 3 of these units are independent study (399H, 499H, 599H) as specified by your department. You must complete each class with a minimum grade of B.
- You must have completed 9 units of upper-division course work or 21 overall units in your major before you can be admitted to Honors in the Major. Check the requirements for your major carefully, as there may be specific courses that must be included in these units.
- Your cumulative GPA should be at least 3.5 or within the top 5% of majors in your department.
- Your GPA in your major should be at least 3.5 or within the top 5% of majors in your department.
- Most students apply for or are invited to participate in Honors in the Major during the second semester of their junior year. Then they complete the 6 units of course work over the two semesters of their senior year.
- Your honors work culminates with a public presentation of your honors project.

While Honors in the Major is part of the Honors Program, each department administers its own program. Please contact your major department or major advisor to apply.

See Bachelor's Degree Requirements (https://catalog.csuchico.edu/undergraduate-requirements/bachelors-degree-requirements/) for complete details on general degree requirements. A minimum of 39 units, including those required for the major, must be upper division.

General Education Requirements: 48 units

See General Education (https://catalog.csuchico.edu/colleges-departments/undergraduate-education/general-education/) and the Class Schedule (http://www.csuchico.edu/schedule/) for the most current information on General Education Requirements and course offerings.

This major has approved GE modification(s). See below for information on how to apply these modification(s).

- BIOL 360 is an approved major course substitution for Upper Division Scientific Inquiry and Quantitative Reasoning (UD-B).

Diversity Course Requirements: 6 units

You must complete a minimum of two courses that focus primarily on cultural diversity. At least one course must be in U.S. Diversity (USD) and at least one in Global Cultures (GC). See Diversity Requirements (https://catalog.csuchico.edu/undergraduate-requirements/diversity-requirements/) for a full list of courses. Most courses taken to satisfy these requirements may also apply to General Education (https://catalog.csuchico.edu/colleges-departments/undergraduate-education/general-education/).

Upper-Division Writing Requirement

Writing Across the Curriculum (EM 17-009 (http://www.csuchico.edu/prs/EMS/2017/17-009.shtml)) is a graduation requirement and may be demonstrated through satisfactory completion of four Writing (W) courses, two of which are designated by the major department. See Mathematics/Quantitative Reasoning and Writing Requirements (https://catalog.csuchico.edu/undergraduate-requirements/mathematicsquantitative-reasoning-writing-requirements/) for more details on the four courses. The first of the major designated Writing (W) courses is listed below.

- BIOL 371W Microbiology (W)