BS MARINE SCIENCES

Program Learning Objectives
Graduates of the BS Marine Sciences program will be able to:

1. Integrate and synthesize information from the various marine disciplines.
2. Recognize and value the diversity of marine life and ecosystems.
3. Apply the scientific method, by formulating hypotheses, making predictions, and assessing, analyzing, synthesizing, and interpreting data.
4. Communicate marine scientific principles and research findings effectively to diverse audiences verbally and in writing.
5. Demonstrate proficiency in lab and field techniques relevant to marine sciences.
6. Locate and utilize bibliographic resources and demonstrate the ability to evaluate 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>Biomarker</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,B4)</td>
<td>4</td>
</tr>
<tr>
<td>BIO 162</td>
<td>Introduction to Organismal Form and Function</td>
<td>4</td>
</tr>
<tr>
<td>BIO 263</td>
<td>Introductory Ecology and Evolution</td>
<td>4</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>2</td>
</tr>
<tr>
<td>CHEM 302</td>
<td>Marine Chemistry</td>
<td>3</td>
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<tr>
<td>MSCI 100</td>
<td>Introduction to Marine Sciences</td>
<td>1</td>
</tr>
<tr>
<td>MSCI 301</td>
<td>Biological Oceanography</td>
<td>3</td>
</tr>
<tr>
<td>MSCI 303</td>
<td>Ocean Sampling Techniques</td>
<td>3</td>
</tr>
<tr>
<td>MSCI 328</td>
<td>Marine Ecology</td>
<td>4</td>
</tr>
<tr>
<td>PSC 201</td>
<td>Physical Oceanography</td>
<td>4</td>
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</tbody>
</table>

Marine Resources Conservation and Policy

Select from the following:

<table>
<thead>
<tr>
<th>Biomarker</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 401</td>
<td>Principles of Conservation Biology</td>
<td>4</td>
</tr>
<tr>
<td>MSCI 428</td>
<td>Marine Conservation and Policy</td>
<td>1</td>
</tr>
<tr>
<td>MSCI 438</td>
<td>Aquaculture</td>
<td>3</td>
</tr>
<tr>
<td>MSCI 439</td>
<td>Fisheries Science and Resource Management</td>
<td>3</td>
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</table>

Communicating Science

Select from the following:

<table>
<thead>
<tr>
<th>Biomarker</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMS 390</td>
<td>Environmental Communication</td>
<td>4</td>
</tr>
<tr>
<td>COMS 395</td>
<td>Science Communication</td>
<td>4</td>
</tr>
<tr>
<td>ENGR 322/SCM 302</td>
<td>The Learn By Doing Lab Teaching Practicum</td>
<td>3</td>
</tr>
<tr>
<td>MSCI 401</td>
<td>Marine Science Outreach</td>
<td>3</td>
</tr>
<tr>
<td>MSCI 440</td>
<td>Communicating Ocean Sciences to Informal Audiences</td>
<td>3</td>
</tr>
</tbody>
</table>

Electives

Select additional courses from Marine Resource Conservation and Policy, Marine Biodiversity, or Communicating Science (above) or select from the following:

<table>
<thead>
<tr>
<th>Biomarker</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>AG/EDES/ENGR/GEOG/ISLA/SCM/UNIV 350</td>
<td>The Global Environment (Area F)</td>
<td>4</td>
</tr>
<tr>
<td>BIO 200</td>
<td>Special Problems for Undergraduates</td>
<td>4</td>
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<tr>
<td>BIO 327</td>
<td>Wildlife Ecology</td>
<td>4</td>
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<tr>
<td>BIO 330</td>
<td>Extended Field Biology Activity</td>
<td>3</td>
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<tr>
<td>BIO 351</td>
<td>Principles of Genetics</td>
<td>3</td>
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<tr>
<td>BIO 361</td>
<td>Principles of Animal Physiology</td>
<td>3</td>
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<tr>
<td>BIO 400</td>
<td>Special Problems for Advanced Undergraduates</td>
<td>3</td>
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<tr>
<td>BIO 414</td>
<td>Evolution</td>
<td>3</td>
</tr>
<tr>
<td>BIO 415</td>
<td>Biogeography</td>
<td>3</td>
</tr>
<tr>
<td>BIO 419</td>
<td>Analytical Methods in Ecology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 434</td>
<td>Environmental Physiology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 442</td>
<td>Behavioral Ecology</td>
<td>3</td>
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<tr>
<td>BIO 444</td>
<td>Population Ecology</td>
<td>3</td>
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<tr>
<td>BIO 445</td>
<td>Community Ecology</td>
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<tr>
<td>BIO 446</td>
<td>Ecosystem Ecology</td>
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<tr>
<td>BIO 450</td>
<td>Undergraduate Laboratory Assistantship</td>
<td>3</td>
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<tr>
<td>BIO 452</td>
<td>Cell Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 461</td>
<td>Senior Project - Research Proposal</td>
<td>2</td>
</tr>
<tr>
<td>BIO 462</td>
<td>Senior Project - Research</td>
<td>2</td>
</tr>
<tr>
<td>BIO 463</td>
<td>Honors Research</td>
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<tr>
<td>BIO 470</td>
<td>Selected Advanced Topics</td>
<td>3</td>
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<tr>
<td>BIO 471</td>
<td>Selected Advanced Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>BIO 472</td>
<td>Current Topics in Biological Research</td>
<td>3</td>
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<tr>
<td>BIO/CHEM 475</td>
<td>Molecular Biology Laboratory</td>
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<tr>
<td>CHEM 217</td>
<td>Organic Chemistry II</td>
<td>3</td>
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<tr>
<td>CHEM 218</td>
<td>Organic Chemistry III</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 220</td>
<td>Organic Chemistry Laboratory For Life Sciences II</td>
<td>3</td>
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</tbody>
</table>
or CHEM 221 Organic Chemistry Laboratory II
CHEM 223 Organic Chemistry Laboratory for Life Sciences III
 or CHEM 324 Organic Chemistry Laboratory III
CHEM 313 Survey of Biochemistry and Biotechnology
CHEM 331 Quantitative Analysis
CHEM 341 Environmental Chemistry: Water Pollution
CHEM 371 Biochemical Principles
CHEM 372 Metabolism
CHEM 400 Special Problems for Advanced Undergraduates
CPE/CSC 101 Fundamentals of Computer Science
CSC/CPE 202 Data Structures
CSC/CPE 203 Project-Based Object-Oriented Programming and Design
CRP/NR 404 Environmental Law
EE 201 Electric Circuit Theory
EE 321 Electronics
ENGR 400 Special Problems for Advanced Undergraduates
ENVE 434 Water Chemistry and Water Quality Measurements
MATH 143 Calculus III
MATH 244 Linear Analysis I
MICRO 436 Microbial Ecology
MSCI 307 World Aquaculture: Applications, Methodologies and Trends
MSCI 330 Technologies for Ocean Discovery (Area F)
MSCI 410 Scientific Diving
NR/LA 317 The World of Spatial Data and Geographical Information Technology (Area F)
NR 321 Water Systems Technology, Issues and Impacts (Area F)
PHYS 400 Special Problems for Advanced Undergraduates
STAT 323 Design and Analysis of Experiments I
 or STAT 324 Applied Regression Analysis
 or STAT 334 Applied Linear Models
STAT 330 Statistical Computing with SAS
STAT 331 Statistical Computing with R

SUPPORT
CHEM 127 General Chemistry for Agriculture and Life Science I (B3) 1
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
 or CHEM 312 Survey of Organic Chemistry
GEOL 102 Introduction to Geology
MATH 141 Calculus I (B1) 1,5
 or MATH 161 Calculus for the Life Sciences I
MATH 142 Calculus II (B1) 1,5
 or MATH 162 Calculus for the Life Sciences II
PHYS 121 College Physics I 6
 or PHYS 141 General Physics IA
PHYS 122 College Physics II 5
 or PHYS 132 General Physics II
PHYS 123 College Physics III 6
 or PHYS 133 General Physics III
STAT 218 Applied Statistics for the Life Sciences
STAT 313 Applied Experimental Design and Regression Models

GENERAL EDUCATION (GE)
(See GE program requirements below.)

FREE ELECTIVES
Free Electives 4

Total units 180

1 Required in Major/Support; also satisfies GE.
2 If BIO 461 or BIO 462 meets the Senior Project requirement, it cannot also be counted for Approved Electives.
3 Maximum of 6 units may be applied toward Approved Electives from "by arrangement" courses: BIO 330, BIO 400, BIO 450, BIO 461, BIO 462, BIO 463, BIO 470, BIO 471, BIO 472, ENGR 322/ SCM 302.
4 If a course double counts for GE Area F as well as Approved Electives, four additional units of Free Electives will be needed to meet 180 total units required for degree.
5 Students emphasizing Chemistry, Physics or Engineering should take MATH 141 and MATH 142 instead of MATH 161 and MATH 162.
6 Students emphasizing Physics should take PHYS 141, PHYS 132 and PHYS 133 instead of PHYS 121, PHYS 122 and PHYS 123.

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
A2 Oral Communication
A3 Reasoning, Argumentation and Writing

Area B Science and Mathematics
B1 Mathematics/Statistics (8 units in Major or Support) 1
B2 Life Science (4 units in Major or Support) 1
B3 Physical Science (4 units in Major or Support) 1
<table>
<thead>
<tr>
<th>Area</th>
<th>Category</th>
<th>Course Description</th>
<th>Units</th>
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<tbody>
<tr>
<td>B4</td>
<td>One lab taken with either a B2 or B3 course</td>
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<tr>
<td>Area C</td>
<td>Arts and Humanities</td>
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<tr>
<td>C1</td>
<td>Literature</td>
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<tr>
<td>C2</td>
<td>Philosophy</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>C3</td>
<td>Fine/Performing Arts</td>
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<td>4</td>
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<tr>
<td>C4</td>
<td>Upper-division elective</td>
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<tr>
<td>Area C elective</td>
<td>(Choose one course from C1-C5)</td>
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<tr>
<td>Area D/E</td>
<td>Society and the Individual</td>
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<tr>
<td>D1</td>
<td>The American Experience (Title 5, Section 40404 requirement)</td>
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<tr>
<td>D2</td>
<td>Political Economy</td>
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<tr>
<td>D3</td>
<td>Comparative Social Institutions</td>
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<td>D4</td>
<td>Self Development (CSU Area E)</td>
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<td>D5</td>
<td>Upper-division elective</td>
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<tr>
<td>Area F</td>
<td>Technology</td>
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<tr>
<td>F</td>
<td>Upper-division elective</td>
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</table>

Total units: 56