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>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,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 Experience</td>
<td>2</td>
</tr>
<tr>
<td>CHEM 302</td>
<td>Marine Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>MSCI 100</td>
<td>Introduction to Marine Sciences</td>
<td>1</td>
</tr>
<tr>
<td>MSCI 300</td>
<td>Marine Ecology</td>
<td>4</td>
</tr>
<tr>
<td>MSCI 301</td>
<td>Biological Oceanography</td>
<td>3</td>
</tr>
<tr>
<td>MSCI 403</td>
<td>Ocean Sampling Techniques</td>
<td>4</td>
</tr>
<tr>
<td>PSC 201</td>
<td>Physical Oceanography</td>
<td>4</td>
</tr>
</tbody>
</table>

Marine Resources Conservation and Policy

Select from the following:

- BIO 363 Principles of Conservation Biology
- MSCI 428 Marine Conservation and Policy
- MSCI 438 Aquaculture
- MSCI 439 Fisheries Science and Resource Management

Communicating Science

Select from the following (excess units will be applied to Electives):

- COMS 390 Environmental Communication
- COMS 395 Science Communication
- ENGR 322/SCM 302 The Learn By Doing Lab Teaching Practicum
- MSCI 401 Marine Science Outreach
- MSCI 440 Communicating Ocean Sciences to Informal Audiences

Electives

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

- AG/EDES/ENGR/GEOG/ISLA/SCM/UNIV 350 The Global Environment (B7)
- BIO 200 Special Problems for Undergraduates
- BIO 300 Research Experience for Undergraduates
- BIO 327 Wildlife Ecology
- BIO 330 Extended Field Biology Activity
- BIO 351 Principles of Genetics
- BIO 361 Principles of Animal Physiology
- BIO 400 Special Problems for Advanced Undergraduates
- BIO 413 Evolutionary Medicine
- BIO 414 Evolution
- BIO 415 Biogeography
- BIO 419 Analytical Methods in Ecology
- BIO 434 Environmental Physiology
- BIO 442 Behavioral Ecology
- BIO 444 Population Ecology
- BIO 445 Community Ecology
- BIO 446 Ecosystem Ecology
- BIO 450 Undergraduate Laboratory Assistantship
- BIO 452 Cell Biology
- BIO 461 Senior Project - Research Proposal
- BIO 462 Senior Project Research Experience
- BIO 463 Honors Research
- BIO 470 Selected Advanced Topics
- BIO 471 Selected Advanced Laboratory
- BIO 472 Current Topics in Biological Research
- BIO/CHEM 475 Molecular Biology Laboratory
- CHEM 217 Organic Chemistry II

Select from the following:

- BIO 322 Ichthyology
- BIO 336 Invertebrate Zoology
- MCRO 436 Microbial Ecology
- MSCI 324 Marine Mammals, Birds and Reptiles
- MSCI 437 Marine Botany
CHEM 218 | Organic Chemistry III
CHEM 220 | Organic Chemistry Laboratory For Life Sciences II
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
COMS 390 | Environmental Communication
COMS 395 | Science Communication
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
DATA 301 | Introduction to Data Science
EE 201 | Electric Circuit Theory
EE 321 | Electronics
ENGR 322/SCM 302 | The Learn By Doing Lab Teaching Practicum
ENGR 400 | Special Problems for Advanced Undergraduates
ENVE 434 | Water Chemistry and Water Quality Measurements
MATH 143 | Calculus III
MATH 244 | Linear Analysis I
MCRO 436 | Microbial Ecology
MSCI 307 | World Aquaculture: Applications, Methodologies and Trends
MSCI 330 | Technologies for Ocean Discovery (B7)
MSCI 401 | Marine Science Outreach
MSCI 410 | Scientific Diving
MSCI 440 | Communicating Ocean Sciences to Informal Audiences
NR/LA 317 | The World of Spatial Data and Geographic Information Technology (B7)
NR 321 | Water Systems Technology, Issues and Impacts (B7)
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) 1,7
or MATH 161 | Calculus for the Life Sciences I

MATH 142 | Calculus II (B1) 1,7
or MATH 162 | Calculus for the Life Sciences II

PHYS 121 | College Physics I 8
or PHYS 141 | General Physics IA

PHYS 122 | College Physics II 8
or PHYS 132 | General Physics II

PHYS 123 | College Physics III 8
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 9

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 Courses used to meet a core requirement cannot be used to double-count in Electives.
4 No more than 3 units from COMS 390, COMS 395; ENGR 322/SCM 302; MSCI 440.
5 Maximum of 2 units may be applied toward Approved Electives from ENGR 322/SCM 302.
6 Maximum of 6 units may be applied toward Electives: BIO 200, BIO 300, BIO 400, BIO 450, MSCI 401.
7 Students emphasizing in Chemistry, Physics or Engineering should take MATH 141 and MATH 142 instead of MATH 161 and MATH 162. GE B1 will be met with any of the following: MATH 161, MATH 162, MATH 141, MATH 142.
8 Students emphasizing in Physics should take PHYS 141, PHYS 132 and PHYS 133 instead of PHYS 121, PHYS 122 and PHYS 123. GE B3 will be met with any of the following: PHYS 141, PHYS 132, PHYS 121 or PHYS 122.
9 If a General Education (GE) course is used to satisfy a Major or Support requirement, additional units of Free Electives may be needed to complete the total units required for the degree.
## 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>A1</th>
<th>Expository Writing</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>A2</td>
<td>Oral Communication</td>
<td>4</td>
</tr>
<tr>
<td>A3</td>
<td>Reasoning, Argumentation and Writing</td>
<td>4</td>
</tr>
</tbody>
</table>

### Area B  
**Math, Science, and Quantitative Reasoning**

<table>
<thead>
<tr>
<th>B1</th>
<th>Mathematics/Statistics (8 units in Major or Support)</th>
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</thead>
<tbody>
<tr>
<td>B2</td>
<td>Life Science (4 units in Major or Support)</td>
<td>0</td>
</tr>
<tr>
<td>B3</td>
<td>Physical Science (4 units in Major or Support)</td>
<td>0</td>
</tr>
<tr>
<td>B4</td>
<td>One lab taken with either a B2 or B3 course</td>
<td></td>
</tr>
<tr>
<td>B7</td>
<td>Upper-division elective</td>
<td>4</td>
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</tbody>
</table>

### Area C  
**Arts and Humanities**

<table>
<thead>
<tr>
<th>C1</th>
<th>Literature</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2</td>
<td>Philosophy</td>
<td>4</td>
</tr>
<tr>
<td>C3</td>
<td>Fine/Performing Arts</td>
<td>4</td>
</tr>
<tr>
<td>C4</td>
<td>Upper-division elective</td>
<td>4</td>
</tr>
<tr>
<td>Area C elective</td>
<td>(Choose one course from C1-C5)</td>
<td>4</td>
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</tbody>
</table>

### Area D  
**Society and the Individual**

<table>
<thead>
<tr>
<th>D1</th>
<th>The American Experience (Title 5, Section 40404 requirement)</th>
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</thead>
<tbody>
<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>
</tr>
</tbody>
</table>

### Area E  
**Lifelong Learning and Self-Development**

| E      | Lower-division elective                                    | 4 |

Total units: 56

1 Required in Major/Support; also satisfies GE.