# MARINE SCIENCES (BS)

## 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 (https://catalog.calpoly.edu/academic-standards-policies/general-requirements-bachelors-degree/#generaleducationtext) section of this catalog, including:

- 40 units of upper-division courses
- 2.0 GPA
- Graduation Writing Requirements (GWR)
- U.S. Cultural Pluralism (USCP)

Note: No Major, Support or Concentration courses may be selected as credit/no credit. In addition, no more than 12 units of cooperative or internship courses can count towards your degree requirements.

| Code | Title | Units |
|---|---|---|
| **MAJOR COURSES** | | |
| MSCI 1100 | Orientation to Marine Sciences | 1 |
| MSCI 1111 | The Oceans (5B) [1] | 3 |
| MSCI 1112 | The Oceans Laboratory | 1 |
| MSCI 3300 | Marine Ecology | 4 |
| PSC 2201 | Physical Oceanography (5A) [1] | 3 |
| MSCI 3301 | Biological Oceanography | 3 |
| CHEM 3370 | Marine Chemistry | 3 |
| Select from the following: [2] | | 2 |
| BIO 4461 | Senior Project - Research Proposal | |
| BIO 4462 | Senior Project - Research Experience | |
| BIO 4463 | Senior Project - Meta-analysis in Biology | |
| Marine Science Electives | | |
| Select a minimum of 4 courses from the following: [3,4] | | 13 |
| BIO 3322 | Ichthyology | |
| BIO 3326 | Invertebrate Zoology | |
| BIO 4443 | Climate Change Biology | |
| MSCI 3303 | Ocean Technologies and Data | |
| MSCI 3324 | Marine Mammals, Birds, and Reptiles | |
| MSCI 4403 | Field Oceanography | |
| MSCI 4437 | Marine Botany | |
| MSCI 4438 | Aquaculture | |
| MSCI 4439 | Marine Fisheries and Conservation | |
| MSCI 4440 | Communicating Ocean Sciences to Informal Audiences | |
| **SUPPORT COURSES** | | |
| BIO 1150 | Life: History and Diversity (5C) [1] | 4 |
| BIO 1151 | Life: Molecules and Cells | 4 |
| CHEM 1120 | Fundamentals of Chemical Structure and Properties | 4 |
| CHEM 1122 | Fundamentals of Chemical Reactivity | 4 |
| CHEM 2240 | Organic Chemistry: Fundamentals and Applications | 4-5 |
| or CHEM 2242 | Organic Chemistry I | |
| MATH 1261 | Calculus I (2) [1,5] | 4 |
| or MATH 1264 | Calculus for Data Science I | |
| PHYS 1121 | College Physics I [6] | 4 |
| or PHYS 1141 | General Physics I | |
| PHYS 1123 | College Physics II [6] | 4 |
| or PHYS 1143 | General Physics II | |

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|---|---|---|
| STAT 1110 | Applied Statistical Concepts and Methods | 3 |
| **APPROVED ELECTIVES** | | |
| Select from the following (a minimum of 6 units must be 3000-4000 level): | | 14 |
| BIO 2200 | Special Problems for Undergraduates [7] | |
| BIO 2253 | Principles of Ecology and Evolution | |
| BIO 3300 | Research Experience for Undergraduates [7] | |
| BIO 3327 | Wildlife Ecology | |
| BIO 3351 | Principles of Genetics | |
| BIO 3352 | Principles of Animal Physiology | |
| BIO 4400 | Special Problems for Advanced Undergraduates [7] | |
| BIO 4413 | Evolutionary Medicine | |
| or BIO 4414 | Evolution | |
| BIO 4422 | Environmental Physiology | |
| BIO 4442 | Behavioral Ecology | |
| BIO 4444 | Population and Community Ecology | |
| BIO 4446 | Ecosystem Ecology | |
| BIO 4449 | Biogeography | |
| BIO 4450 | Undergraduate Laboratory Assistantship [7] | |
| BIO 4451 | Bioinformatics Applications | |
| BIO 4452 | Cell Biology | |
| BIO 4457 | Molecular Biology Laboratory | |
| BIO 4463 | Senior Project - Meta-analysis in Biology [2] | |
| BIO 4466 | Honors Research [7] | |
| BIO 4470 | Special Advanced Topics | |
| BIO 4471 | Special Advanced Laboratory | |
| BIO 4472 | Current Topics in Biological Research | |
| BIO 4485 | Cooperative Education Experience [7] | |
| BIO 4495 | Cooperative Education Experience [7] | |
| CHEM 2201 | Undergraduate Research | |
| CHEM 2244 | Organic Chemistry II | |
| CHEM 3330 | Foundations of Chemical Analysis | |
| CHEM 3350 | Biochemistry: Fundamentals and Applications | |
| or CHEM 3352 | Biochemistry | |
| CHEM 3354 | Metabolism | |
| CHEM 3372 | Environmental Chemistry | |
| COMS 3390 | Environmental Communication [8] | |
| or COMS 3395 | Science Communication | |
| CSC 1001 & 1001L | Fundamentals of Computer Science and Fundamentals of Computer Science Laboratory | |
| CSC 1031 | Programming for Engineers | |
| CSC 1032 | Programming for Scientists and Engineers | |
| CSC 2001 & 2001L | Data Structures and Data Structures Laboratory | |
| ENGR/SCM 3302 | The Learn By Doing Lab Teaching Practicum [8] | |
| ENGR 4400 | Special Problems for Advanced Undergraduates [7] | |
| ENVE 2331 | Fundamentals of Environmental Engineering | |
| ENVE 3434 | Chemistry of Environmental Systems | |
| ENVE 4400 | Special Problems [7] | |
| GEOL 2200 | Special Problems for Undergraduates [7] | |
| GEOL 2240 & GEOL 2241 | Physical Geology and Physical Geology Laboratory | |
| GEOL 3330 | Principles of Stratigraphy | |
| GEOL 4400 | Special Problems for Advanced Undergraduates [7] | |

| | | |
|---|---|---|
| MATH 1151 | Linear Algebra | |
| MATH 1262 | Calculus II | |
| or MATH 1265 | Calculus for Data Science II | |
| MATH 2263 | Calculus III | |
| MATH 2341 | Linear Analysis | |
| MCRO 2224 | General Microbiology I | |
| MCRO 4436 | Microbial Ecology | |
| MSCI 4401 | Marine Science Outreach [8] | |
| MSCI 4410 | Scientific Diving | |
| MSCI 4440 | Communicating Ocean Sciences to Informal Audiences | |
| PHYS 2200 | Special Problems for Undergraduates | |
| PHYS 3314 | Ocean Dynamics | |
| PHYS 4400 | Special Problems for Advanced Undergraduates [7] | |
| STAT 1810 | Introduction to Statistical Computing with R | |
| STAT 3430 | Applied Regression Analysis | |
| STAT 3520 | Statistics II | |
| STAT 3530 | Applied Linear Models | |
| STAT 3540 | Statistical Methods for Study Design and Analysis | |
| STAT 3800 | Introduction to Statistical Computing with SAS and SQL | |
| STAT 4760 | Statistical Analysis of Time Series | |
| **GENERAL EDUCATION (GE)** | | |
| (See GE program requirements below) | | 33 |
| **FREE ELECTIVES** | | |
| Free Electives [9] | | 4-5 |
| **Total Units** | | **120** |

1 Required in Major or Support; also satisfies General Education (GE) requirement.

2 If BIO 4461, BIO 4462, BIO 4463, CHEM 4461, PHYS 4461, or PHYS 4462 is used to meet the senior project requirement, it cannot be double-counted as an elective. If a student takes more than one of these courses, the additional units can be applied to electives.

3 Courses taken to meet a Major or Support requirement cannot be double-counted in Approved Electives.

4 Excess units will be applied to Approved Electives.

5 Students emphasizing in Chemistry, Engineering, or Physics should take MATH 1261.

6 Students emphasizing in Physics should take PHYS 1141 and PHYS 1143 instead of PHYS 1121 and PHYS 1123. Note: MATH 1261 is required for PHYS 1141.

7 Maximum of 6 units may be applied toward Approved Electives: BIO 2200, BIO 3300, BIO 4400, BIO 4450, BIO 4466, BIO 4485, BIO 4495, ENGR 4400, ENVE 4400, GEOL 2200, GEOL 4400, PHYS 4400.

8 A maximum of 3 units from COMS 3390, COMS 3395, ENGR/SCM 3302, MSCI 4401.

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

# General Education (GE) Requirements

- 43 units required, 10 of which are specified in Major and/or Support.
- If any of the remaining 33 Units 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.
- See the complete GE course listing (https://catalog.calpoly.edu/academic-standards-policies/general-requirements-bachelors-degree/#generaleducationtext).
- A grade of C- or better is required in one course in each of the following GE Areas: 1A (English Composition), 1B (Critical Thinking), 1C (Oral Communication), and 2 (Mathematics and Quantitative Reasoning).

**Lower-Division General Education**

| **Area 1** | **English Communication and Critical Thinking** | |
|---|---|---|
| 1A | Written Communication | 3 |
| 1B | Critical Thinking | 3 |

| | | |
|---|---|---|
| 1C | Oral Communication | 3 |
| **Area 2** | **Mathematics and Quantitative Reasoning** | |
| 2 | Mathematics and Quantitative Reasoning (3 units in Support) [1] | 0 |
| **Area 3** | **Arts and Humanities** | |
| 3A | Arts | 3 |
| 3B | Humanities: Literature, Philosophy, Languages other than English | 3 |
| **Area 4** | **Social and Behavioral Sciences (Area 4 courses must come from at least two different course prefixes.)** | |
| 4A | American Institutions (Title 5, Section 40404 Requirement) | 3 |
| 4B | Social and Behavioral Sciences | 3 |
| **Area 5** | **Physical and Life Sciences** | |
| 5A | Physical Sciences (3 units in Major) [1] | 0 |
| 5B | Life Sciences (3 units in Major) [1] | 0 |
| 5C | Laboratory (may be embedded in a 5A or 5B course) (1 units in Support) [1] | 0 |
| **Area 6** | **Ethnic Studies** | |
| 6 | Ethnic Studies | 3 |
| **Upper-Division General Education** | | |
| Upper-Division 2/5 | Mathematics and Quantitative Reasoning or Physical and Life Sciences | 3 |
| Upper-Division 3 | Arts and Humanities | 3 |
| Upper-Division 4 | Social and Behavioral Sciences (Area 4 courses must come from at least two different course prefixes.) | 3 |
| **Total Units** | | **33** |

[1] Required in Major or Support; also satisfies General Education (GE) requirement.