

MARINE SCIENCES (BS)

Offered at: San Luis Obispo Campus

The degree is an integrative program designed to prepare students for advanced training or professional employment in public or private agencies concerned with issues related to marine science, oceanography and marine biology. While this degree is based in Biological Sciences, the program includes faculty from other disciplines including chemistry, physics, mathematics, engineering, and computer science. The degree instills students with critical thinking and analytical skills in areas such as oceanography, marine organismal physiology, conservation, fisheries, oceanographic sampling and data networks. Through the use of experience-based learning including faculty-led research projects, students will develop essential knowledge as well as a solid foundation in community-oriented education in the interdisciplinary field of marine sciences. Students may not double major in Biological Science and Marine Science.

Program Learning Objectives

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 diverse audiences.
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.
7. Relate ethical, social justice or global perspectives to the study and practice of marine science.

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	
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 or COMS 3395	Environmental Communication ⁸ 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 or MATH 1265	Calculus II 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)	
FREE ELECTIVES	
Free Electives ⁹	
Total Units	

33

4-5

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

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

Coming soon