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 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/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		
BIO 150	Diversity and History of Life	4
BIO 161	Introduction to Cell and Molecular Biology (B2 & B3) [1]	4
BIO 162	Introduction to Organismal Form and Function	4
BIO 263	Introductory Ecology and Evolution	4
BIO 461	Senior Project - Research Proposal [2]	2
or BIO 462	Senior Project Research Experience	
CHEM 302	Marine Chemistry	3
MSCI 100	Orientation to Marine Sciences	1
MSCI 300	Marine Ecology	4
MSCI 301	Biological Oceanography	3
MSCI 403	Ocean Sampling Techniques	4
PSC 201	Physical Oceanography	4
Marine Resources Conservation and Policy		
Select from the following: [3]		4
BIO 363	Principles of Conservation Biology	
MSCI 428	Marine Conservation and Policy	
MSCI 438	Aquaculture	
MSCI 439	Fisheries Science and Resource Management	
Marine Biodiversity		
Select from the following: [3]		4
BIO 322	Ichthyology	
BIO 336	Invertebrate Zoology	
MCRO 436	Microbial Ecology	
MSCI 324	Marine Mammals, Birds and Reptiles	
MSCI 437	Marine Botany	
Communicating Science		
Select from the following (excess units will be applied to Electives): [3]		1
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 Resources Conservation and Policy, Marine Biodiversity, or Communicating Science (above) or select from the following: [3]		25
At least 18 units must be upper-division. Select courses carefully to ensure that you have taken enough 300-400 level courses to meet the required 60 units of upper-division courses for the degree.		
AG/EDES/ENGR/ GEOG/ISLA/ SCM/UNIV 350	The Global Environment	
ASCI 290	Animal Production and Management Enterprise	
ASCI 490	Advanced Animal Production and Management Enterprise	
BIO 200	Special Problems for Undergraduates [4]	
BIO 300	Research Experience for Undergraduates [4]	
BIO 327	Wildlife Ecology	
BIO 330	Extended Field Biology Activity [4]	
BIO 351	Principles of Genetics	
BIO 361	Principles of Animal Physiology	
BIO 400	Special Problems for Advanced Undergraduates [4]	
BIO 413	Evolutionary Medicine	
BIO 414	Evolution	
BIO 415	Biogeography	
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 [4]	

BIO 452	Cell Biology
BIO 461	Senior Project - Research Proposal [2]
BIO 462	Senior Project Research Experience [2]
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
BRAE 333	Aquacultural Engineering
CHEM 201	Undergraduate Research
CHEM 217	Organic Chemistry II
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 314	Biochemistry: Fundamentals and Applications
CHEM 331	Quantitative Analysis
CHEM 341	Environmental Chemistry: Water Pollution
CHEM 369	Biochemical Principles
CHEM 372	Metabolism
CHEM 400	Special Problems for Advanced Undergraduates [4]
CHEM 401	Advanced Undergraduate Research
COMS 390	Environmental Communication [5]
COMS 395	Science Communication [5]
CPE/CSC 101	Fundamentals of Computer Science
CRP/NR 404	Environmental Law
CSC/CPE 202	Data Structures
CSC/CPE 203	Project-Based Object-Oriented Programming and Design
CSC 231	Programming for Engineering Students
CSC 232	Computer Programming for Scientists and Engineers
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 [5,6]
ENGR 400	Special Problems for Advanced Undergraduates [4]
ENVE 331	Fundamentals of Environmental Engineering
ENVE 400	Special Problems
ENVE 434	Water Chemistry and Water Quality Measurements
GEOL 200	Special Problems for Undergraduates
GEOL 241	Physical Geology Laboratory
GEOL 330	Principles of Stratigraphy
GEOL 400	Special Problems for Advanced Undergraduates
MATH 143	Calculus III
MATH 241	Calculus IV
MATH 244	Linear Analysis I
MCRO 224	General Microbiology I
MCRO 436	Microbial Ecology
MSCI 401	Marine Science Outreach [4]
MSCI 410	Scientific Diving
MSCI 440	Communicating Ocean Sciences to Informal Audiences [5]
NR 218	Introduction to Geographic Information Systems (GIS)
NR/LA 317	The World of Spatial Data and Geographic Information Technology
NR 321	Water Resources Technology and Society
PHYS 200	Special Problems for Undergraduates
PHYS 314	Ocean Dynamics
PHYS 400	Special Problems for Advanced Undergraduates [4]
PHYS 461	Senior Project I
PHYS 462	Senior Project II
STAT 323	Design and Analysis of Experiments I
STAT 324	Applied Regression Analysis
or STAT 334	Applied Linear Models
STAT 330	Statistical Computing with SAS
STAT 331	Statistical Computing with R
STAT 416	Statistical Analysis of Time Series

SUPPORT

CHEM 127	General Chemistry for Agriculture and Life Science I (B1) [1]	4
CHEM 128	General Chemistry for Agriculture and Life Science II	4
CHEM 129	General Chemistry for Agriculture and Life Science III	4
CHEM 216	Organic Chemistry I [7]	5
or CHEM 312	Organic Chemistry: Fundamentals and Applications	
GEOL 102	Introduction to Geology	4
MATH 141	Calculus I (B4) [1,8]	4
or MATH 161	Calculus for the Life Sciences I	
MATH 142	Calculus II (GE Electives) [1,8]	4
or MATH 162	Calculus for the Life Sciences II	
PHYS 121	College Physics I [9]	4
or PHYS 141	General Physics I	
PHYS 122	College Physics II [9]	4
or PHYS 142	General Physics II	
PHYS 123	College Physics III [9]	4
or PHYS 143	General Physics III	
STAT 218	Applied Statistics for the Life Sciences	4
STAT 313	Applied Experimental Design and Regression Models (Upper-Division B) [1]	4

GENERAL EDUCATION (GE)	
(See GE program requirements below.)	52
FREE ELECTIVES	
Free Electives [7,10]	8
Total units	**180**

1. Required in Major or Support; also satisfies General Education (GE) requirement.
2. If BIO 461 or BIO 462 is used to meet the senior project requirement, it cannot be double-counted as an Elective.
3. If a course is taken to meet a Major or Support requirement, it cannot be double-counted as an Elective.
4. Maximum of 6 units may be applied toward Electives: BIO 200, BIO 300, BIO 330, BIO 400, BIO 450, BIO 485, BIO 495, CHEM 400, ENGR 400, MSCI 401, PHYS 400.
5. No more than 3 units from COMS 390, COMS 395, ENGR 322/SCM 302, MSCI 440.
6. Maximum of 2 units may be applied toward Electives from ENGR 322/SCM 302.
7. If CHEM 216 is taken, then some Free Electives may need to be 300-400 level to ensure completion of the required minimum of 60 units of upper-division.
8. Students emphasizing in Chemistry, Physics or Engineering should take MATH 141 and MATH 142 instead of MATH 161 and MATH 162. GE Area B4 will be met with any of the following: MATH 161, MATH 162, MATH 141, MATH 142.
9. Students emphasizing in Physics should take PHYS 141, PHYS 142 and PHYS 143 instead of PHYS 121, PHYS 122 and PHYS 123. GE Area B1 will be met with any of the following: PHYS 121, PHYS 122, PHYS 141 or PHYS 142.
10. 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, 20 of which are specified in Major and/or Support.
- If any of the remaining 52 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/generalrequirementsbachelorsdegree/#generaleducationtext).
- A grade of C- or better is required in one course in each of the following GE Areas: A1 (Oral Communication), A2 (Written Communication), A3 (Critical Thinking), and B4 (Mathematics/Quantitative Reasoning).

Area A	**English Language Communication and Critical Thinking**	
A1	Oral Communication	4
A2	Written Communication	4
A3	Critical Thinking	4
Area B	**Scientific Inquiry and Quantitative Reasoning**	
B1	Physical Science (4 units in Support) [1]	0
B2	Life Science (4 units in Major) [1]	0
B3	One lab taken with either a B1 or B2 course	
B4	Mathematics/Quantitative Reasoning (4 units in Support) [1]	0
Upper-Division B (4 units in Support) [1]		0
Area C	**Arts and Humanities**	
Lower-division courses in Area C must come from three different subject prefixes.		
C1	Arts: Arts, Cinema, Dance, Music, Theater	4
C2	Humanities: Literature, Philosophy, Languages other than English	4
Lower-Division C Elective - Select a course from either C1 or C2		4
Upper-Division C		4
Area D	**Social Sciences - Select courses in Area D from at least two different prefixes**	
D1	American Institutions (Title 5, Section 40404 Requirement)	4
D2	Lower-Division D	4
Upper-Division D		4
Area E	**Lifelong Learning and Self-Development**	
Lower-Division E		4
Area F	**Ethnic Studies**	
F	Ethnic Studies	4
GE Electives in Areas B, C, and D		
Select courses from two different areas; may be lower-division or upper-division courses.		
GE Electives (4 units in Support plus 4 units in GE) [1]		4
Total units		**52**

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