MARINE & COASTAL SCIENCE, BACHELOR OF SCIENCE

College of Agricultural & Environmental Sciences

The major in Marine & Coastal Science focuses on the interdisciplinary nature of marine sciences by exposing students to core, breadth, and focus area courses in the discipline, in addition to a strong foundation of science preparatory material. The major builds upon UC Davis strengths in marine and coastal sciences, including field-based courses offered at Bodega Marine Laboratory to provide students a unique, interdisciplinary, "hands on" education. Advising is provided by the Department of Earth & Planetary Sciences for interested students.

The Program

The major begins with introductory courses in mathematics, chemistry, physics, biology, and earth sciences. These are followed by core courses in Marine Science. The major requirements provide focus and breadth, so that each student gains mastery in one area and broad exposure to many facets of Marine & Coastal Science. Focus areas are:

- Coastal Environmental Processes
- Marine Ecology & Organismal Biology
- Marine Environmental Chemistry
- Oceans & the Earth System

In this major, students will be exposed to the foundation disciplines within marine science (biology, chemistry, geology, physics) as well as modern issues facing marine and coastal environments; e.g., climate change, pollution, carbon cycling, and conservation. The major requires field experience, independent research or internship, and concludes with a capstone course featuring current research in marine science. These integrative experiences will require students to synthesize the interdisciplinary topics that they have encountered through this degree program. The mastery achieved provides a strong foundation for future careers in academic science, government, policy, and the private sector. For more information, see Marine & Coastal Science (https://eps.ucdavis.edu/mcs/).

Focus Areas

The student's chosen Focus Area will determine the college into which the student is admitted, the college where the degree is awarded, and the associated department:

- **Coastal Environmental Processes.** College of Agricultural & Environmental Sciences; Environmental Science & Policy
- **Marine Ecology & Organismal Biology.** College of Biological Sciences; Evolution & Ecology
- **Marine Environmental Chemistry.** College of Agricultural & Environmental Sciences; Environmental Toxicology
- **Oceans & the Earth System.** College of Letters & Science; Earth & Planetary Sciences

Undergraduate Research

The marine sciences span many departments and colleges at UC Davis, and so students have opportunities to participate in undergraduate research (https://eps.ucdavis.edu/students/undergrad/mcsci/research/) in many disciplines.

Internships & Careers

A B.S. in Marine & Coastal Science provides students with knowledge and practical experience needed to pursue careers (https://eps.ucdavis.edu/students/undergrad/mcsci/careers/) in marine science (government, private sector, research). The major program includes research and internship experiences as well as field experience to help prepare students for these career paths.

Advising

Visit the staff major advisor (https://eps.ucdavis.edu/students/undergrad/advising/) for help navigating major requirements and planning for your degree. Visit the faculty major advisors (https://eps.ucdavis.edu/students/undergrad/advising/) for additional advice on courses, careers, and graduate school. Faculty advisors: Tessa Hill (College of Letters & Science), Anne Todgham (College of Agricultural & Environmental Sciences), Rachael Bay (College of Biological Sciences).

Visit your college's advisors for help navigating University Degree Requirements and College Degree Requirements (https://catalog.ucdavis.edu/undergraduate-education/college-degree-requirements/).

Bodega Marine Laboratory

Students in the Marine & Coastal Science major are required to complete some of their coursework at the Bodega Marine Laboratory (https://marinescience.ucdavis.edu/bml/about/) on the California Coast.

Global Learning in Marine & Coastal Science

Consider studying or interning abroad through programs available through the Global Learning Hub (https://eps.ucdavis.edu/students/undergrad/mcsci/studyabroad/).

Get Involved

Find your community (https://eps.ucdavis.edu/students/undergrad/mcsci/involved/) through clubs, events, seminars, and workshops relating to marine science.

Graduation Honors

Students graduating from the College of Agricultural and Environmental Sciences or College of Biological Sciences are eligible for Departmental Honors, High Honors, or Highest Honors depending on their GPA (https://catalog.ucdavis.edu/academic-information-policies-regulations/honors-prizes/). This is calculated automatically and added to students' final transcripts.

Students graduating from the College of Letters & Science are eligible for Departmental Honors, depending on their GPA and whether or not they complete a Senior Thesis. Students who graduate with a GPA in the top percentages of their college (https://catalog.ucdavis.edu/academic-information-policies-regulations/honors-prizes/) will automatically graduate with Honors. Students who qualify for Honors at graduation may also be eligible for High Honors or Highest Honors, based upon the quality of their Senior Thesis (course number 194A-194B) or Senior Honors Thesis (course number 194HA-194HB). It is Department of Earth and Planetary Sciences policy that an "A-" grade on the thesis will earn the student High Honors, and an "A" grade will earn the student Highest Honors.

Graduate Study

The coursework, research opportunities, and fieldwork requirements in the Marine & Coastal Science major help prepare students to enter

graduate programs to continue their studies and prepare for their career in the marine sciences. Students should meet with advisors and faculty to build a strong application for graduate school through additional independent research or other co-curricular involvements.

The major requirements below are in addition to meeting University Degree Requirements (https://catalog.ucdavis.edu/undergraduate-education/university-degree-requirements/) & College Degree Requirements (https://catalog.ucdavis.edu/undergraduate-education/college-degree-requirements/); unless otherwise noted. The minimum number of units required for the Marine & Coastal Science Bachelor of Science is 95.

Code	Title	Units
Preparatory Subject Matter		
Biological Science		*15*
BIS 002A & BIS 002B & BIS 002C	Introduction to Biology: Essentials of Life on Earth and Introduction to Biology: Principles of Ecology & Evolution and Introduction to Biology: Biodiversity & the Tree of Life	
Chemistry		
Choose a series: [1]		15
CHE 002A & CHE 002B & CHE 002C	General Chemistry and General Chemistry and General Chemistry	
OR		
CHE 004A & CHE 004B & CHE 004C	General Chemistry for the Physical Sciences & Engineering and General Chemistry for the Physical Sciences & Engineering and General Chemistry for the Physical Sciences & Engineering	
Organic Chemistry		
Choose a series; only required for students in the Marine Ecology & Organismal Biology focus area: [2]		0-13
CHE 008A & CHE 008B	Organic Chemistry: Brief Course and Organic Chemistry: Brief Course	
OR		
CHE 118A & CHE 118B & CHE 118C	Organic Chemistry for Health & Life Sciences and Organic Chemistry for Health & Life Sciences and Organic Chemistry for Health & Life Sciences	
OR		
CHE 128A & CHE 128B & CHE 128C & CHE 129A & CHE 129B	Organic Chemistry and Organic Chemistry and Organic Chemistry and Organic Chemistry Laboratory and Organic Chemistry Laboratory	
Mathematics		
Choose a series; students in Marine Ecology & Organismal Biology focus area must take MAT 017A-MAT 017B-MAT 017C or MAT 021A-MAT 021B. [3]		8-12
MAT 016A & MAT 016B DISCC & MAT 016C DISCC	and and (Discontinued)	
OR		
MAT 017A & MAT 017B & MAT 017C	Calculus for Biology & Medicine and Calculus for Biology & Medicine and Calculus for Biology & Medicine	
OR		
MAT 019A & MAT 019B & MAT 019C	Calculus for Data-Driven Applications and Calculus for Data-Driven Applications and Calculus for Data-Driven Applications	
OR		
MAT 021A & MAT 021B & MAT 021C	Calculus and Calculus and Calculus	
Physics		
Choose a series: [4]		12-15
PHY 007A & PHY 007B & PHY 007C	General Physics and General Physics and General Physics [6]	
OR		
PHY 009A & PHY 009B & PHY 009C	Classical Physics and Classical Physics and Classical Physics	
Recommended:		
EVE 012	Life in the Sea	
GEL 016 or GEL 016V	The Oceans The Oceans	
Preparatory Subject Matter Subtotal		50-70
Depth Subject Matter		
STA 100	Applied Statistics for Biological Sciences	4
EVE/ESP 111	Marine Environmental Issues	1
Choose three of the following four:		10-11
GEL/ESP 116N	Oceanography	
GEL/ESP 150A	Physical & Chemical Oceanography	
GEL/ESP 150B	Geological Oceanography	
GEL/ESP 150C	Biological Oceanography	
Choose two:		7-8
ATM 120	Atmospheric Thermodynamics & Cloud Physics	
ESP 100	General Ecology	
ESP 110	Principles of Environmental Science	
ETX 101	Principles of Environmental Toxicology	
EVE 100	Introduction to Evolution	
EVE 101	Introduction to Ecology	
EVE 112	Biology of Invertebrates	
HYD 103N/ EBS 103	Fluid Mechanics Fundamentals	
Marine Ecology & Organismal Biology Focus Area Only:		0-13
BIS 101 or BIS 101V	Genes & Gene Expression Genes & Gene Expression	
BIS 104	Cell Biology	
BIS 105 or BIS 102 & BIS 103	Biomolecules & Metabolism Structure & Function of Biomolecules and Bioenergetics & Metabolism	
Depth Subject Matter Subtotal:		22-37

Courses cannot be utilized to fulfill multiple requirements, with the exception that any Bodega Marine Laboratory course simultaneously fulfills the field requirement below and ETX 127/NUT 127 may satisfy both a course and the Research Requirement.	
Focus Area	
Complete at least four courses from one category below, totaling at least 12 units.	12
Coastal Environmental Processes; College of Agricultural & Environmental Sciences; Environmental Science & Policy (p. 3)	
Marine Ecology & Organismal Biology; College of Biological Sciences; Evolution & Ecology (p. 4)	
Marine Environmental Chemistry; College of Agricultural & Environmental Sciences; Environmental Toxicology (p. 4)	
Oceans & the Earth System; College of Letters & Science; Earth & Planetary Sciences (p. 4)	
Focus Area Requirement Subtotal	12
Breadth Requirement	
Complete one course from each category below, that is not the student's chosen Focus Area, totaling at least 8 units.	8
Coastal Environmental Processes (p. 5)	
Marine Ecology & Organismal Biology (p. 5)	
Marine Environmental Chemistry (p. 5)	
Oceans & the Earth System (p. 5)	
Breadth Requirement Subtotal	8
Field Requirement	
Fulfill the Field Requirement	0-14
The Field Requirement provides exposure to field techniques, experimental design, and the marine environment itself. It is highly recommended that students fulfill this requirement by residence at Bodega Marine Laboratory for one or more courses. Bodega Marine Laboratory courses may simultaneously fulfill an additional requirement in categories above	
OR	
Alternatively, students may fulfill the Field Requirement by taking two of the following courses; these courses cannot fulfill multiple requirements:	
ESP 123 Introduction to Field & Laboratory Methods in Ecology	
ESP 151L Limnology Laboratory	
EVE 112L Biology of Invertebrates Laboratory	
EVE 115 Marine Ecology	
GEL 109L Earth History: Sediments & Strata Laboratory	
GEL 182 Field Studies in Marine Geochemistry (Discontinued)	
WFC 100 Field Methods in Wildlife, Fish, & Conservation Biology	
WFC 102L Field Studies in Fish Biology: Laboratory	
WFC 157 Coastal Ecosystems	
Field Requirement Subtotal	0-14
Internship/Research	
Choose three units:	3
ETX/NUT 127 Environmental Stress & Development in Marine Organisms (may satisfy both a course above and the Internship/Research Requirement.)	
BIS 124 Coastal Marine Research	
ESP 192 Internship	
EVE 192 Internship	
EVE 199 Special Study for Advanced Undergraduates	
GEL 192 Internship in Geology	
GEL 199 Special Study for Advanced Undergraduates (or the equivalent)	
Internship/Research Subtotal	3
Total Units	**95-144**

[1] With BASC advisor approval, these combinations also satisfy the Chemistry requirement: CHE 004A-CHE 002A (3 units w/no lab)-CHE 002B-CHE 002C; CHE 004A-CHE 004B-CHE 002C.

[2] With BASC advisor approval, these combinations also satisfy the Organic Chemistry requirement: CHE 118A-CHE 008B; CHE 128A-CHE 128B-CHE 008B; CHE 128A-CHE 118B-CHE 118C; CHE 128A-CHE 128B-CHE 129A-CHE 118C; CHE 118A-CHE 128B-CHE 128C-CHE 129A-CHE 129B; CHE 118A-CHE 118B-CHE 128C-CHE 129B.

[3] With BASC advisor approval, these combinations also satisfy the Mathematics requirement: MAT 021A-MAT 017B-MAT 017C; MAT 017A-MAT 021B.

[4] Students may be able to complete their Physics requirement by blending the PHY 007 & PHY 009 series. For more details about how to do so and course placement, students will need to follow up with the PHY department. Students in the College of Biological Sciences will also need to follow up with a BASC advisor to discuss their plans.

Focus Area Requirement

Complete at least four courses from one category below, totaling at least 12 units.

Coastal Environmental Processes

Emphasis on processes and environments of the coastal zone, and the strong physical-biological connection that exists here. Courses highlight the critical terrestrial marine interface and fundamental physical processes in the coastal zone.

The focus area requirement can be fulfilled using:

Code	Title	Units
ATM 121A	Atmospheric Dynamics	4
ATM 121B	Atmospheric Dynamics	4
ATM 158	Boundary-Layer Meteorology	4
ETX 102A	Environmental Fate of Toxicants	4
ESP 152	Coastal Oceanography	3
ESP 155	Wetland Ecology	4
ESP 155L	Wetland Ecology Laboratory (Discontinued)	3

ESP 166	Ocean & Coastal Policy	3
GEL 156/HYD 146	Hydrogeology & Contaminant Transport	5
GEL 182	Field Studies in Marine Geochemistry (Discontinued)	2-8
HYD 103N/EBS 103	Fluid Mechanics Fundamentals	4
HYD 134	Aqueous Geochemistry	6
HYD 143	Ecohydrology	4
HYD/EBS 144	Groundwater Hydrology	4
WFC 157	Coastal Ecosystems	4

1

HYD 134 is a 5 unit course; see your advisor (https://lawr.ucdavis.edu/students/undergrad-programs/hydrology/) for options.

Marine Ecology & Organismal Biology

Focus on physiological adaptations to the marine environment, and the biology of marine species from the molecular to population levels. Courses include emphasis on the ecological processes that determine the distribution and abundance of marine organisms, and the patterns and mechanisms of evolution in the ocean.

The focus area requirement can be fulfilled using:

Code	Title	Units
ANS 131	Reproduction & Early Development in Aquatic Animals	4
BIS 122	Population Biology & Ecology	3
BIS 122P	Population Biology & Ecology/Advanced Laboratory Topics	5
BIS 124	Coastal Marine Research	6
ESP 100	General Ecology	4
ESP 121	Population Ecology	4
ESP 124	Marine & Coastal Field Ecology	3
ESP 155	Wetland Ecology	4
ESP 155L	Wetland Ecology Laboratory (Discontinued)	3
EVE 100	Introduction to Evolution	4
EVE 101	Introduction to Ecology	4
EVE 106	Mechanical Design in Organisms (Discontinued)	3
EVE 112	Biology of Invertebrates	3
EVE 112L	Biology of Invertebrates Laboratory	2
EVE 114	Experimental Invertebrate Biology	3
EVE 115	Marine Ecology	4
EVE 120	Global Change Ecology	3
ETX/NUT 127	Environmental Stress & Development in Marine Organisms	10
WFC 120	Biology & Conservation of Fishes	3
WFC 120L	Laboratory in Biology & Conservation of Fishes	2
WFC 121	Physiology of Fishes	4
WFC 122	Population Dynamics & Estimation	4
WFC 130	Physiological Ecology of Wildlife	4

Marine Environmental Chemistry

Emphasis on major themes in marine chemistry, geochemistry, the carbon cycle, and contaminant fate and transport.

The focus area requirement can be fulfilled using:

Code	Title	Units
CHE 100	Environmental Water Chemistry	3
ECI 140A	Environmental Analysis of Aqueous Systems (Not open for credit to students who have taken CHE 100)	4
ETX 101	Principles of Environmental Toxicology	4
ETX 102A	Environmental Fate of Toxicants	4
ETX 120	Perspectives in Aquatic Toxicology	4
ETX/NUT 127	Environmental Stress & Development in Marine Organisms	10
GEL 148	Stable Isotopes & Geochemical Tracers	3
GEL 182	Field Studies in Marine Geochemistry (Discontinued)	2-8
HYD 134	Aqueous Geochemistry	6
HYD 141	Physical Hydrology	4
WFC 153	Wildlife Ecotoxicology	4

1

HYD 134 is a 5 unit course; see your advisor (https://lawr.ucdavis.edu/students/undergrad-programs/hydrology/) for options.

Oceans & the Earth System

A study of our changing oceans in the context of earth system history, including climate change, paleoceanography, ecological shifts, conservation, and marine policy.

The focus area requirement can be fulfilled using:

Code	Title	Units
ATM 116	Modern Climate Change	3
ESM 120	Global Environmental Interactions	4
ESM 121	Water Science & Management	3
ESP 110	Principles of Environmental Science	4
ESP 161	Environmental Law	4
ESP 162	Environmental Policy	4
ESP 166	Ocean & Coastal Policy	3
ESP 169	Water Policy & Politics	3
EVE 120	Global Change Ecology	3
GEL 107	Earth History: Paleobiology	3
GEL 107L	Earth History: Paleobiology Laboratory	2
GEL 108	Earth History: Paleoclimates	3
GEL 109	Earth History: Sediments & Strata	3
GEL 109L	Earth History: Sediments & Strata Laboratory	2
GEL 144	Historical Ecology	3
SAS 120	Science & Contemporary Societal Issues	3
WFC 144	Marine Conservation Science	4
WFC 154	Conservation Biology	4

Breadth Requirement

Complete one course from each category below, that is not the student's chosen Focus Area, totaling at least 8 units.

Coastal Environmental Processes

The breadth requirement can be fulfilled using the following courses:

Code	Title	Units
ATM 158	Boundary-Layer Meteorology	4
ECI 140B	Chemical Principles for Environmental Engineers	4
ESP 110	Principles of Environmental Science	4
ESP 152	Coastal Oceanography	3
ESP 155	Wetland Ecology	4
GEL 182	Field Studies in Marine Geochemistry (Discontinued)	2-8
WFC 157	Coastal Ecosystems	4

Marine Ecology & Organismal Biology

The breadth requirement can be fulfilled using the following courses:

Code	Title	Units
BIS 124	Coastal Marine Research	6
ESP 124	Marine & Coastal Field Ecology	3
ESP 155	Wetland Ecology	4
EVE 106	Mechanical Design in Organisms (Discontinued)	3
EVE 114	Experimental Invertebrate Biology	3
EVE 115	Marine Ecology	4
EVE 120	Global Change Ecology	3
ETX/NUT 127	Environmental Stress & Development in Marine Organisms	10

Marine Environmental Chemistry

The breadth requirement can be fulfilled using the following courses:

Code	Title	Units
CHE 100	Environmental Water Chemistry	3
ECI 140B	Chemical Principles for Environmental Engineers	4
ETX 120	Perspectives in Aquatic Toxicology	4
ETX/NUT 127	Environmental Stress & Development in Marine Organisms	10
GEL 182	Field Studies in Marine Geochemistry (Discontinued)	2-8
HYD 134	Aqueous Geochemistry	6
HYD 141	Physical Hydrology	4

1

HYD 134 is a 5 unit course; see your advisor (https://lawr.ucdavis.edu/students/undergrad-programs/hydrology/) for options.

Oceans & the Earth System

The breadth requirement can be fulfilled using the following courses:

Code	Title	Units
ATM 116	Modern Climate Change	3
ESP 166	Ocean & Coastal Policy	3
EVE 120	Global Change Ecology	3
GEL 107	Earth History: Paleobiology	3
GEL 108	Earth History: Paleoclimates	3
WFC 144	Marine Conservation Science	4
WFC 154	Conservation Biology	4

Total Units for the Major by Chosen Focus Area

Focus Area	Units
Oceans & the Earth System (Letters & Science)	95-118
Marine Ecology & Organismal Biology (Biological Sciences)	110-144
Marine Environmental Chemistry (Agricultural & Environmental Sciences)	95-118
Coastal Environmental Processes (Agricultural & Environmental Sciences)	95-118