

# CCS Marine Science Major Sheet, B.A. 2023-24

## Required Courses and electives

General education (GE) requirements include 8 courses *unrelated* to your major and 2 courses *related* to your major. To qualify as a GE course, the class must be outside the scope of your major. Additionally, you must fulfill the University Ethnicity requirement, American History and Institutions requirement and the Writing requirement.

Preparation for the major will include foundation courses across the disciplines of Chemistry, Biology, Earth Science, Engineering, Physics, Probability and Statistics, and Math as shown in the table below. Transfer students from on and off campus should have completed similar introductory course work in these disciplines and should check out the example schedule for Transfer students below. Students may work with their faculty advisor to replace particular courses with relevant research experience or other appropriate coursework. Students will also work with their faculty advisor to tailor their courses to meet prerequisites specific to their specialization.

Upper division (UD) coursework within the major must total at-least 48 units and is divided into three categories: 1) courses required of all majors; 2) core courses selected from an approved list (Marine CS 10; and 3) courses reflecting an upper division emphasis selected in consultation with your faculty mentor. (These are detailed below).

1. Courses Required of All Majors

Marine CS 100A, Ways of knowing in marine science  
 Marine CS 100B, Modern practices in marine science  
 Marine CS 109, The Sea off Southern California  
 Marine CS 160, Research seminar in marine science

2. Two (2) Core Courses Selected From this List

Marine CS 101 Chemical Oceanography (= EARTH 266/GEOG 267)  
 Marine CS 102 Biological Oceanography (= EEMB 243)  
 Marine CS 103 Introduction to Physical Oceanography (= GEOG 263)  
 Marine CS 104 Geological Oceanography (= EARTH 276)  
 Marine CS 105 Marine Conservation and Ecology (= EEMB 242)

3. Upper Division Emphasis

The remainder of the upper division coursework is to be selected by the student in consultation with the faculty mentor, and will constitute the student's emphasis within the major. These will be selected from existing courses across campus (see below).

	Fall	Winter	Spring
Year One	Math 3A (4) MCDB 1A (4) Chemistry 1A/1AL (5) Biology CS 10/12 (3)	Math 3B (4) Physics 6A/AL (4) Chemistry 1B/1BL (5) Biology CS 20 (5)	Math 4A (4) Physics 6B/BL (4) Chemistry 1C (3) Biology CS 30 (5)

	<b>16 Units</b>	<b>18 Units</b>	<b>16 Units</b>
Year Two	Math 4B (4) Physics 6C (3) PSTAT 5LS (5) Marine CS 100A (4) <b>16 Units</b>	GE Course (4) Geography 3A (4) Engineering 3 (4) UD Emphasis (4) <b>16 Units</b>	GE Course (4) Earth 2 (4) Marine CS 100B (4) UD Emphasis (4) <b>16 Units</b>
Year Three	GE Course, Ethnicity (4) UD Emphasis (4) UD Emphasis (4) Elective/Research (4) <b>16 Units</b>	GE Course (4) Marine CS 101 (4) UD Emphasis (4) UD Emphasis (4) <b>16 Units</b>	GE Course (4) Marine CS 160 (1) UD Emphasis (4) Elective/Research (4) <b>13 Units</b>
Year Four	GE Course (4) Marine CS 102 (3) Elective/Research (4) Elective/Research (4) <b>15 Units</b>	GE Course (4) Writing 109ST (4) Marine CS 109 (4) <b>12 Units</b>	GE Course (4) Marine CS 160 (1) Elective/Research (4) Elective/Research (4) <b>13 Units</b>

### Example Schedule for Transfer Students from on and off campus

Transfer students should have completed an introductory biology series, general chemistry series and relevant labs, introductory physics series and relevant labs, math courses that cover calculus and linear algebra, and an introductory statistics course. Additionally, this example course schedule assumes students have completed 5 out of 8 GEs and the Ethnicity requirement. If you have not completed this course work and are interested in the marine science program, please reach out to us to discuss alternative options!

Junior Year	Marine CS 100A (4) UD Emphasis (4) UD Emphasis (4) Elective/Research (4) <b>16 Units</b>	Geography 3A <u>or</u> Engineering 3 (4)  Marine CS 101 (4) UD Emphasis (4) UD Emphasis (4) <b>16 Units</b>	Marine CS 100B (4) Marine CS 160 (1) UD Emphasis (4) Elective/Research (4) <b>13 Units</b>
Senior Year	GE Course (4) Marine CS 102 (3) Elective/Research (4) Elective/Research (4) <b>15 Units</b>	GE Course (4) Writing 109ST (4) Marine CS 109 (4) <b>12 Units</b>	GE Course (4) Marine CS 160 (1) Elective/Research (4) Elective/Research (4) <b>13 Units</b>

### List of courses that may be appropriate for the upper division emphasis requirement (not exhaustive)

CHEM: Chemistry and Biochemistry

CS 103	CCS Chemistry Seminar	110L	Introductory Biochemistry Lab
109A	Organic Chemistry I	109AH	Honors Organic Chemistry I
109B	Organic Chemistry II	109BH	Honors Organic Chemistry II
109C	Organic Chemistry III	109CH	Honors Organic Chemistry III
111	Chemical Kinetics	112A	Biophysical Chemistry I
115A	Quantum Chemistry I	113A	Physical Chemistry I
126	Computation Chemistry and Modeling	127	Structure/Reactivity in Organic
129	Synthetic Organic Reactions	142A	Biochemistry
143	The RNA World	150	Analytical Chemistry
173A	Advanced Inorganic Chemistry I	112B	Biophysical Chemistry II
113B	Physical Chemistry II	115B	Quantum Chemistry II
118	Photochemistry and Radiation	125L	Biochemistry Lab
161	Enzyme Mechanisms	162	Drug Design
171	Bioinorganic Chemistry	173B	Advanced Inorganic Chemistry II
184	Chemistry Literature	112C	Biophysical Chemistry III
112L	Biophysical Chemistry Lab	113C	Physical Chemistry III
115C	Quantum Chemistry III	123	Environmental Chemistry
133	Advanced Synthetic Chemistry	142C	Biochemistry III
145	Computational Biochemistry	147	Biochemical Origins
175	Physical Inorganic Chemistry		

#### EARTH: Earth Science

100	Introduction to Geophysics	104A	Field Geology Methods
105	Earth's Climate	114	Geomaterials
103	Structural Geology	106	Introduction to Climate Models
111	Introduction to Paleontology	111L	Paleontology Lab
115	Analytical Methods	121	Principles of Evolution
123	The Solar System	124IG	Introduction to Geochemistry
130	Global Warming	134	Geological Data Analysis
150	Petroleum Geology	155	Petrotechnics
173	Groundwater	182A	Marine Biogeochemistry
190	Advanced Paleobiology	102A	Igneous Petrology
122	Sediments and Stratification	135	Geophysics
157	Plate Tectonics	149	Mammal History
164B	Earth Systems Ocean-Atmosphere	168	Aqueous Transport

#### EEMB: Ecology Evolution Marine Biology

101	Molecular Evolution	113	Evolution and Ecology Vertebrates
106	Biology of Fishes	113L	Lab/Field Vertebrate Biology
108	Vertebrate Evolution	117	Flow and Ecosystems
112	Invertebrate Zoology	120	Introduction to Ecology
142A	Aquatic Communities	142AL	Methods in Aquatic Communities

153	Lakes and Wetlands	157	Cell Physiology
168	Conservation Ecology	171	Ecosystem Processes
182	Communicating Ocean Science	111	Parasitology
129	Introduction to Genetics	131	Principles of Evolution
136	Principles of Paleontology	136	Paleontology Lab
138	Behavioral Ecology	142B	Processes in Oceans I
142BL	Methods Aquatic Environments I	146	Biometry
152	Applied Marine Ecology	163	Deep Sea Biology
179	Ecological Models	102	Macroevolution
170	Marine Land Interface	142C	Processes in Oceans II
142CL	Methods Aquatic Environments II	148	Stream Ecology
176	Advanced Biostatistics	176L	Advanced Biostatistics Lab
155CC	Global Change Biology	149	Mariculture for the 21 <sup>st</sup> century

#### ECON: Economics

115	Environmental Economics	116A	Industrial Organization Principles
100B	Microeconomic Theory	101	Macroeconomic Theory
117A	Laws and Economics I	120	Urban and Regional Economics
189	Law and Ethics	127	Climate Change
122	Natural Resource Economics		

#### ENV S: Environmental Studies

100	Environmental Ecology	106	Critical Thinking and Environment
116	Building Sustainable Communities	119	Ecology of California Wildlands
131	International Environmental Policy	134EC	Earth in Crisis
147	Air Quality	171	Ecosystem Processes
108O	History of Oceans	111	Channel Islands
115	Energy and the Environment	120	Toxics in the Environment
125A	Environmental Law	143	Endangered Species
144	Rivers	152	Applied Marine Ecology
174	Environmental Policy and Economics	165B	Environmental Impact Analysis
188	Environmental Ethics	105	Solar and Renewable Energy
117	Science and Policy of Climate Change	128	Ecological Restoration
134	Coastal Processes and Management	136	Green Works
139	Business and Environment	162	Water Quality
168	Aqueous Transport		

#### GEOG: Geography

104	Physical Oceanography	110	Introduction to Meteorology
112	Hydrology	115A	Earth from Above
137	Quantitative Geomorphology	142	Global Biogeochemical Cycles

172	Intermediate Geographical Data	176A	Introduction to GIS
102	Env. Optics in Physical Oceanography	115B	Introduction to Remote Sensing
116	Groundwater	126	Maps in Science and Technology
134	Earth System Science	149	Channel Islands
176B	Technical GIS	115C	Intermediate Remote Sensing
119	Climatic Change	135S	Mock Environmental Summit
144	Rivers	162	Water Quality
163	Ocean Circulation	176C	GIS Applications

MATH: Mathematics

CS 101	Problem Solving	104A	Introduction to Numerical Analysis
108A	Introduction to Linear Algebra	108B	Advanced Linear Algebra
117	Methods of Analysis	104B	Numerical Analysis
122B	Introduction to Complex Variables II	124A	Partial Differential Equations
104C	Advanced Numerical Analysis	124B	Fourier Series
119A	Ordinary Differential Equations	122A	Introduction to Complex Variables I

MCDB: Molecular Cell Developmental Biology

101A	Molecular Genetics I	103	Cell Biology
101AL	Molecular Genetics Lab	103L	Cell Biology Lab
108A	General Biochemistry I	108B	General Biochemistry II
112	Developmental Biology	112L	Developmental Biology Lab
126A	Basic Pharmacology	110	Principles of Biochemistry
126AL	Pharmacology Lab	123	Physical Biochemistry
131	General Microbiology	132	Bacterial Pathogenesis
131L	Microbiology Lab	132	Bacterial Pathogenesis Lab
101B	Molecular Genetics II	108C	General Biochemistry III
109L	Lab in Biochemistry	118	Plant Development
134	General Animal Virology	135	Cell Growth/Oncogenesis
140L	Recombinant DNA	145	Protein Processing

PHYS: Physics

102	Linear Algebra and Applications	103	Intermediate Mechanics
110A	Electromagnetism I	115A	Quantum Mechanics I
119A	Thermal and Statistical Physics I	120	California Physics
123A	Condensed Matter Physics I	127AL	Analogue Electronics
132	Stellar Structure and Evolution	142L	Condensed Matter Lab
144L	Biophysics Lab	101	Complex Variables
145L	Experimental Research in Astrophysics	104	Advanced Mechanics
110B	Electromagnetism II	115B	Quantum Mechanics II
119B	Thermal and Statistical Physics II	123B	Condensed Matter Physics II
127BL	Digital Electronics	133	Galaxies and Cosmology

135	Biophysics and Biomolecular Materials	106	Nonlinear Phenomena
115C	Quantum Mechanics III	131	Gravitation and Relativity
134L	Observational Astrophysics	141	Optics

POL S: Political Science

121	International Politics	127	American Foreign Policy
145	European Union	150A	Middle East Politics
186	International Political Economy	175	Politics of the Environment
119	Ethical Issues in International Relations		

PSTAT: Statistics and Applied Probability

120A	Probability and Statistics I	120B	Probability and Statistics II
126	Regression Analysis	122	Design of Experiments
123	Sampling Technique	120C	Probability and Statistics III