

# CCS Marine Science Major Sheet, B.A.

## 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)<br>MCDB 1A (4)<br>Chemistry 1A/1AL (5)<br>Biology CS 10/12 (3) | Math 3B (4)<br>Physics 6A/AL (4)<br>Chemistry 1B/1BL (5)<br>Biology CS 20 (5) | Math 4A (4)<br>Physics 6B/BL (4)<br>Chemistry 1C (3)<br>Biology CS 30 (5) |

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