Environmental Systems

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There can be little doubt that in the twenty-first century the global human community is facing a substantial growth in the environmental consequences of providing food, energy, materials, and basic services to a population of more than six billion inhabitants. The Environmental Systems Program recognizes the growing demand for environmental specialists and is designed to prepare undergraduates to enter a broad spectrum of environmental careers and graduate programs in, for example, the natural sciences, the social sciences, public policy, law, and business.

This interdisciplinary program recognizes that local, national, regional, international, and global environmental problems do not fit neatly into traditional academic departments. A measurable part of society’s inability to effectively manage complex environmental problems stems from the lack of specialists who can apply analytical tools that cross disciplinary boundaries. Many environmental specialists possess little training in the natural sciences including both the fundamental ideas and methodologies of the earth and environmental sciences. The environmental systems major was created to address both of these shortcomings.

To encourage and foster an interdisciplinary focus in the major, the Environmental Systems Program is supported by a wide range of UCSD faculty representing the natural sciences, the social sciences, the humanities, engineering, and medicine. The program includes a required lower-division core, an upper-division “integrating course sequence,” two other upper-division courses and statistics, an advanced track, and a senior integrative project and seminar. There is a strong emphasis on a rigorous natural science foundation as well as an introduction to the policy sciences for all students enrolled in the major.

The Environmental Systems program places a significant value on interdisciplinary problem solving and all majors are expected to complete an integrative Senior Project in their final year. The Senior Project is designed by the student to focus on an interdisciplinary environmental problem or research topic. Appropriate topics for the Senior Project could conceivably include biodiversity conservation, coastal zone management, environmental health, climate change, environmental justice, and/or urban air quality. An important component of the Senior Project is an off-campus or laboratory internship where students might work on, for example, the development of a comprehensive management plan for a threatened ecosystem. The Senior Seminar provides a venue for the presentation and group evaluation of the ESYS Senior Projects. Distinction in the major may be awarded for outstanding projects.

The Environmental Systems Major

The requirements for completion of the environmental systems major include a lower-division core, two upper-division courses, a three course upper-division integrating sequence (ESYS 101, ESYS 102, ESYS 103), an upper-division statistics course, advanced courses in one of four tracks, and the senior project (ESYS 190A) and senior seminar (ESYS 190B). Any questions concerning the requirements should be directed to the associate director or the program adviser. Students completing the advanced tracks in “Earth Sciences,” “Ecology, Behavior, and Evolution,” and “Environmental Chemistry” will be awarded a B.S. in environmental systems. The B.A. in environmental systems will be granted to students completing the “Environmental Policy” track within the major.

A grade-point average of 2.0 or higher in the upper-division major program is required for graduation. Students must receive a grade of C– or better in any course to be counted toward fulfillment of the major requirements. In exceptional cases, students with a grade-point average in the major of 2.5 or greater may petition to have one grade of D accepted.

LOWER-DIVISION CORE REQUIREMENTS

(Should be completed early in student’s degree program.)

Biology 3—BILD 3
Mathematics 6A, 6B, 6BL, 6C—Environmental Chemistry track students must also complete Mathematics 6CL
Physics 1A, 1B, 1C—Earth Sciences track students complete Physics 2A-B-C

UPPER-DIVISION CORE REQUIREMENTS

Mathematics 10A, 10B, 10C—Earth Sciences track students complete Math. 20A-B, 21C, and Math. 21D is recommended

Economics 2A

“Integrating Course Sequence”

(Should be taken junior year.)

Environmental Systems 101. The Living Earth
Environmental Systems 102. The Solid and Fluid Earth
Environmental Systems 103. The Human Earth
Environmental Systems 190A. Integrative Project (two quarters)
Environmental Systems 190B. Senior Seminar
Environmental Systems

Major Tracks

There are four advanced tracks in which students must complete a minimum of seven upper-division courses. Students will select courses following the requirements below in consultation with a faculty adviser.

Earth Sciences

Ecology, Behavior, and Evolution

Environmental Chemistry

Environmental Policy

The program is working with the School of Engineering to create an "Environmental Engineering" track to be offered at a future date.

Earth Sciences Track

Required upper-division courses:

ERTH 101. Introduction to Earth and Environmental Sciences
ERTH 102. Introduction to Geochemistry
MATH 183. Statistical Methods (This statistics course, required in sophomore year)
Upper-division electives: (must complete a minimum of seven courses)

Solid Earth emphasis:

ERTH 103. Introduction to Geophysics
ERTH 104. Geobiology
ERTH 120. Introduction to Mineralogy
ERTH 130. Geodynamics of Terrestrial Planets
ERTH 144. Isotope Geochemistry
ERTH 160. Introduction to Tectonics
ERTH 162A. Introduction to Field Geology
ERTH 162L. Structural Analysis for Field Geology
ERTH 180. Geophysics of Natural Resources
ERTH 182. Field Geophysics
SIO 210. Physical Oceanography
SIO 260. Marine Chemistry
SIO 240. Marine Geology
Other ERTH/SIO courses by petition

Ocean/Atmosphere emphasis:

ERTH 142. Atmospheric Chemistry and Biochemical Cycles
Chemistry 149A. Environmental Chemistry
Chemistry 173. Atmospheric Chemistry
SIO 240. Marine Geology
SIO 269. Special Topics in Marine Chemistry
SIO 280. Biological Oceanography
BIEB 130. Introduction to Marine Ecology
Other courses may be substituted by petition.

CURRICULUM GUIDE PLANNING

FALL WINTER SPRING

FRESHMAN
Chem. 6A Chem. 6B Chem. 6C
Math. 20A Math. 20B Math. 21C
Math. 6BL BILD 3

SOPHOMORE
Math. 21D Phys. 2B Phys. 2C
(recommended) Econ. 131 UD EYS elective
Phys. 2A Pol. 160AA or 168
Econ. 2a

JUNIOR
ERTH 101 ERTH 102 EYS 103
EYS 101 EYS 102 UD EYS elective
Math. 183 UD EYS elective UD EYS elective

SENIOR
EYS 190A EYS 190A EYS 190B
UD EYS elective UD EYS elective UD EYS elective

Ecology, Behavior, and Evolution Track

Required upper-division courses:

BICD 110. Cell Biology
BICD 120. Fundamental of Plant Biology
BICD 130. Embryos, Genes, and Development
BICD 134. Human Reproduction and Development
BIEB 102. Introductory Ecology—Organisms and Habitats
BIEB 121. Ecology Laboratory
BIEB 126. Plant Ecology
BIEB 130. Introduction to Marine Ecology
BIEB 140. Biodiversity
BIEB 150. Evolution
BIEB 156. Population Genetics
BIEB 164. Behavioral Ecology
BIEB 166. Animal Communication
BIEB 170. Field Ecology (WMRS)
BIEB 171. Physiological Ecology (WMRS)
BIEB 172. Applied Conservation Biology (WMRS)
BIEB 176. Conservation and the Human Predicament
BIEB 178. Principles of Conservation Ecology
BIEB 179. Conservation Biology Laboratory
BIEB 180. Principles of Conservation Genetics
BIMM 100. Molecular Biology
BIMM 110. Molecular Basis of Disease
BIMM 114. Virology
BIMM 120. Bacteriology
BIMM 121. Laboratory in Microbiology
BIMM 124. Medical Microbiology
BIMM 126. Environmental Microbiology
BIMM 127. Environmental Microbiology Laboratory
BIPN 100. Mammalian Physiology I
BIPN 102. Mammalian Physiology II
BIPN 105. Animal Physiology Lab (6)
BIPN 106. Comparative Physiology (4)
Other courses may be substituted by petition.

CURRICULUM GUIDE PLANNING

FALL WINTER SPRING

FRESHMAN
Chem. 6A Chem. 6B Chem. 6C
Math. 10A Chem. 6BL Math. 10C
Math. 10B BILD 3
**Environmental Chemistry Track**

Students must complete two of the following courses:

- Chemistry 149A. Environmental Chemistry
- Chemistry 149B. Environmental Chemistry
- Chemistry 173. Atmospheric Chemistry

Students must complete:

- Math. 183. Statistical Methods (This statistics course required in sophomore year)
- Chemistry 140A and B. Organic Chemistry

One upper-division lab from either:

- Chemistry 106. Instrumental Analysis Laboratory
- Chemistry 143A. Organic Chemistry Laboratory

Two other upper-division courses, for example:

- Chemistry 122. Biochemical Evolution
- Chemistry 124. Bioinorganic Chemistry
- Chemistry 126/127. Physical Chemistry
- Chemistry 131/132/133. Physical Chemistry
- Chemistry 140C. Organic Chemistry

Other courses may be substituted by petition.

**Environmental Policy Track**

Students complete a minimum of seven courses selected from the following list. It is also possible to complete the requirements for the Environmental Policy track with a specialization that includes courses from one of the other tracks. For example, a course of study with a focus on conservation biology and policy for students who may be interested in the policy and scientific dimensions of habitat conservation planning for endangered species, would include advanced courses from the Ecology, Behavior, and Evolution track.

One upper-division Statistics course—ANGN 157. The Analysis of Systematic Data

- Economics 132. Energy Economics
- Economics 125. Economics of Population Growth
- Economics 116. Economic Development
- Economics 130. Public Policy
- Political Science 102L. The Politics of Regulation
- Political Science 125. The Politics of Conservation in Developing Countries