

# ENVIRONMENTAL SYSTEMS

## Master of Science degree in Environmental Systems –

with options in Energy Technology & Policy; Environmental Resources Engineering; Geology; and Mathematical Modeling

*This program is administered by the coordinator of the environmental systems graduate program of the College of Natural Resources and Sciences.*

### Coordinator

Rick Zechman, Ph.D.

### Graduate Office

College of Natural Resources & Sciences  
Forestry 101  
707-826-3256

### The Program

Students completing this program will have demonstrated:

- the ability to read the current literature in their area with understanding and insight
- the ability to apply that current research to the solution of environmental and resource management problems in their area of interest
- the ability to successfully work as a team member on the solution of environmental and resource management problems
- the ability to clearly articulate an understanding of and solutions to environmental and resource management problems
- the ability to define and conceptualize an environmental problem, develop an appropriate approach to its solution, successfully complete the project, and clearly communicate the results.

The **Energy Technology and Policy Option** is an interdisciplinary program for students interested in issues ranging from renewable energy engineering to climate change mitigation, and from international development to energy policy in California. The program offers a rigorous curriculum for students who are interested in making a difference in these important areas of work.

Career possibilities: energy engineer, energy policy analyst, environmental projects manager, international development worker.

The **Environmental Resources Engineering Option** focuses on systems analysis and numerical methods for advanced studies.

Career possibilities: environmental engineer, water quality engineer, energy engineer, water resources engineer.

The **Geology Option**, during its first year, gives a quantitative and qualitative background for research in applied geology. Students usually spend their summers on thesis research. The second year is devoted to research, data analysis, and writing the thesis.

Career possibilities: field geologist, engineering geologist, exploration geophysicist, hydrologist, and marine geologist.

The **Mathematical Modeling Option** offers a range of mathematical techniques and applications. Students spend their second year on specific topics involving advanced modeling techniques in solving an environmental problem.

Career possibilities: mathematical modeler, systems analyst, resources analyst, and teacher.

### Preparation

Earn an approved bachelor's degree for the selected option.

Satisfy general admission requirements.

Earn satisfactory test scores from the verbal and quantitative sections of the Graduate Record Examination.

File a statement of objectives with reasons for pursuing a master's degree with a particular option.

### REQUIREMENTS FOR THE DEGREE

Complete an environmental systems program of courses arranged with a graduate advisor and approved by the faculty graduate committee. The program must include the core courses below plus an environmental systems option. Background deficiencies may be satisfied by taking approved undergraduate courses.

Complete the **core course requirement**:

SCI 698 [1-3] Graduate Colloquium in Environmental Systems

Complete one of the following options: Energy Technology and Policy; Environmental Resources Engineering; Geology; or Mathematical Modeling.

Write an acceptable thesis/project.

### Energy Technology & Policy Option

**Prerequisites.** An appropriate undergraduate degree and sufficient preparation is required. Prior coursework in areas including elementary statistics and probability, calculus, physics, and chemistry is expected. Engineering, math, and natural science students will benefit from having had at least six semester units of sociology, anthropology, economics, political science, or another related social science. Students who aspire to work internationally should have at least one year of training in a language other than English, or equivalent experience. Students with deficient preparation will be expected to satisfy background coursework prior to beginning the program. Deficiencies may be made up concurrently with prior approval in some cases, but this may extend time in the program.

**Required courses.** All core requirements listed under Requirements for the Degree plus the following option requirements:

ENGR 532 [4] Energy, the Environment, and Society

ECON 550 [4] Economics of Energy & Climate Policy

STAT 630 [4] Data Collection & Analysis

And at least one additional course from the following:

ENGR 533 Energy & Climate Change

ENGR 535 Development Technology

**Approved upper division and graduate courses** in a coherent package of a minimum of four elective courses that bring the total to at least 30 units.

### Environmental Resources Engineering Option

**Prerequisites.** Applicants should have an undergraduate major in engineering (civil, mechanical, agricultural, chemical, industrial, environmental, or other) or a related physical science. Students with deficiencies in core competencies associated with Environmental Resources Engineering may be required to take prerequisite coursework.

**Required courses.** All core requirements listed under Requirements for the Degree, plus at least three graduate level engineering courses from an approved list. In addition, students must complete approved

coursework in topics related to engineering, associated sciences, economics, and policy to bring the total number of units to at least 30. Up to 6 units of thesis or project work may be applied to the degree. Note that courses taken at the 400-level for an undergraduate degree may not be repeated at the 500-level for credit towards the graduate degree.

Approved coursework must include one course each in economics and policy. Allowable courses include those listed below or appropriate alternative non-general education upper division or graduate level courses approved by the student's academic advisor.

**Approved economics courses:**

- ECON 423\* (3) Environmental & Natural Resources Economics
- ECON 423D (1) Env. & NR Economics - Add'l Depth
- ECON 550 (4) Economics of Energy & Climate Policy
- ECON 570 (4) Sustainable Rural Economic Development

\*Must be taken concurrently with the corresponding Additional Depth course

**Approved policy courses:**

- ENGR 532 (4) Energy, Environment & Society
- ENGR 545 (3) Water Resources Planning & Mgmt.
- GEOG 473 (1-4) Topics in Advanced Physical Geography

**Geology Option**

**Prerequisites.** Applicants should (a) have an undergraduate major in geology or a related science and (b) submit transcripts and Graduate Record Examination scores in both aptitude and geology. Applicants must have at least a year of college physics and a minimum of two semesters of calculus (three semesters desirable).

**Required courses.** All core requirements above plus option requirements:

- GEOG 550 (3) Fluvial Processes
- GEOG 551 (3) Hillslope Processes
- GEOG 553 (4) Quaternary Stratigraphy
- GEOG 554 (2) Advanced Geology Field Methods
- GEOG 555 (3) Neotectonics
- STAT 630 (4) Data Collection & Analysis

**Approved upper division and graduate courses** in a coherent package to bring the total units to 30. Electives generally will be taken within the College of Natural Resources and Sciences.

**Mathematical Modeling Option**

**Prerequisites.** An appropriate undergraduate degree which includes a background in the following areas: linear algebra, numerical analysis, probability and statistics, real analysis, and differential equations. Deficiencies in any area may be satisfied by taking approved undergraduate courses. Submit GRE test scores in aptitude and an advanced area.

**Required courses.** All core requirements above plus option requirements:

- MATH 521 (3) Applied Stochastic Processes
- MATH 561 (4) Dynamic Systems
- MATH 562 (4) Model Fitting
- MATH 595 (3) Mathematical Modeling Practicum
- MATH 580 (1-4) Selected Topics in Math [at least 3 units]
- STAT 630 (4) Data Collection & Analysis

**Approved upper division courses and graduate courses** to bring total units to 30, producing in-depth knowledge of an area of study in environmental systems or natural resources.

Approved coursework must include a course from outside the mathematics department to support thesis research.

