# **Energy and Resources**

## Minor

The Energy and Resources Group (ERG) offers an undergraduate minor in the field of energy and resources. The Minor in Energy and Resources offers undergraduates the opportunity to develop basic knowledge and skills to help them address the complex and interdependent issues associated with the interaction of social, economic, political, technical, and environmental factors. Though it is designed primarily to complement majors in the natural sciences and engineering, students in any major with the appropriate prerequisites may pursue the ERG Minor.

The Energy and Resources Group is responsible for monitoring the minor program and will designate one faculty member as the Undergraduate Adviser. It is the Undergraduate Adviser who will be charged with certifying completion of the minor. All core faculty members will participate in advising students in the minor, just as they do graduate students.

## **Declaring the Minor**

- Complete the "Intent to Declare ERG Minor" and turn in at 310 Barrows Hall by the end of the fifth week of classes in the semester in which you begin the upper division ERG Minor coursework.
- 2. Submit the "Petition for ERG Minor" within the last two (2) weeks of instruction in the semester you intend to graduate.

For academic information and advising related to the minor consult with ERG's undergraduate faculty adviser.

Students who have a strong interest in an area of study outside their major often decide to complete a minor program. These programs have set requirements and are noted officially on the transcript in the memoranda section, but they are not noted on diplomas.

## **General Guidelines**

- 1. All courses taken to fulfill the minor requirements below must be taken for graded credit.
- 2. A minimum grade point average (GPA) of 2.0 is required for courses used to fulfill the minor requirements.
- No more than one upper-division course may be used to simultaneously fulfill requirements for a student's major and minor programs.

## Requirements

## Lower-division (Six courses)

Select one Math sequence from the following:		
MATH 1A	Calculus	
& MATH 1B	and Calculus	
MATH 16A	Analytic Geometry and Calculus	
& MATH 16B	and Analytic Geometry and Calculus	
Select one Physic	s sequence from the following:	
PHYSICS 7A	Physics for Scientists and Engineers	
& PHYSICS 7	and Physics for Scientists and Engineers	
PHYSICS 8A	Introductory Physics	

CHEM 1A	General Chemistry	3-4
or CHEM 4A	General Chemistry and Quantitative Analysis	
BIOLOGY 1B	General Biology Lecture and Laboratory	4
or BIOLOGY 11	Course Not Available	
Upper-division (Five courses)		
ENE,RES C100	Energy and Society	4
ENE,RES 102	Quantitative Aspects of Global Environmental Problems	4
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Select three upper-division electives, approved by the ERG faculty (see below)

At least one course must be in the social sciences

At least one course must be in the natural sciences or engineering

## Electives

The choice of electives should be made with two goals in mind: exploring the range of approaches available to address energy and resource issues and complementing the student's major. The latter can be achieved by adding relevant depth in closely related areas or by exploring methods and approaches that contrast with the tools and knowledge base employed in the major. Students are encouraged to discuss their program with the ERG faculty.

The following courses have been approved, but students should contact the faculty to request approval of alternate courses.

### **Social Science Electives**

ECON/ ENVECON C102	Natural Resource Economics	4
ECON C171/ ENVECON C151	Economic Development	4
ENE,RES 175	Water and Development	4
ENE,RES C180	Ecological Economics in Historical Context	3
ENE,RES 273	Research Methods in Social Sciences	3
ESPM 102D	Climate and Energy Policy	4
ESPM 155	Sociology and Political Ecology of Agro-Food Systems	4
ESPM 160AC	American Environmental and Cultural History	4
ESPM 161	Environmental Philosophy and Ethics	4
ESPM 168	Political Ecology	4
ESPM 169	International Environmental Politics	4
Natural Science	and Engineering Electives	
CIV ENG 103	Introduction to Hydrology	3
CIV ENG 107	Climate Change Mitigation	3
CIV ENG 111	Environmental Engineering	3
CIV ENG 114	Environmental Microbiology	3
CIV ENG 115	Water Chemistry	3
ENE,RES 101	Ecology and Society	3
EPS 105	Course Not Available	
EPS 117	Geomorphology	4
EPS/ESPM C129	Biometeorology	3
EPS/ESPM C180	Air Pollution	3
ESPM 111	Ecosystem Ecology	4
ESPM 112	Microbial Ecology	3
ESPM 120	Soil Characteristics	3
ESPM 131	Soil Microbial Ecology	3

ESPM 140	General Entomology	4
ESPM 143	Course Not Available	
INTEGBI 106A	Physical and Chemical Environment of the Ocean	4
INTEGBI 152	Environmental Toxicology	4
INTEGBI 153	Ecology	3
INTEGBI 157LF	Ecosystems of California	4
Other Electives		
CY PLAN 119	Planning for Sustainability	3
ENE,RES 170	Environmental Classics	3
ENE,RES 190	Seminar in Energy, Environment, Development and Security Issues	3
ENE,RES 198	Directed Group Studies for Advanced Undergraduates	1-4
ENE,RES 199	Supervised Independent Study and Research	1-4
EPS 170AC	Crossroads of Earth Resources and Society	4
ENV SCI 125	Environments of the San Francisco Bay Area	3
ESPM 118	Agricultural Ecology	3
ESPM C130/ GEOG C136	Terrestrial Hydrology	4
L & S 170AC	Crossroads of Earth Resources and Society	4

## **Energy and Resources**

ENE, RES 24 Freshman Seminar 1 Unit

The Freshman Seminar Program has been designed to provide new students with the opportunity to explore an intellectual topic with a faculty member in a small-seminar setting. Freshman Seminars are offered in all campus departments, and topics may vary from department to department and semester to semester.

Rules & Requirements

**Repeat rules:** Course may be repeated for credit as topic varies. Course may be repeated for credit when topic changes.

### Hours & Format

Fall and/or spring: 15 weeks - 1 hour of seminar per week

**Additional Details** 

Subject/Course Level: Energy and Resources Group/Undergraduate

**Grading/Final exam status:** The grading option will be decided by the instructor when the class is offered. Final exam required.

ENE,RES 98 Directed Group Study for Lower Division Students 1 - 4 Units

Lectures and small group discussions focusing on topics of interest that vary from semester to semester.

Rules & Requirements

**Credit Restrictions:** Enrollment is restricted; see the Introduction to Courses and Curricula section of this catalog.

**Repeat rules:** Course may be repeated with consent of department.Course may be repeated with consent of department.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of directed group study per week

**Additional Details** 

Subject/Course Level: Energy and Resources Group/Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Final exam not required.

ENE,RES 99 Supervised Independent Studies for Freshmen and Sophomores 1 - 4 Units Supervised research on specific topics related to energy and resources. **Rules & Requirements** 

**Prerequisites:** Consent of faculty adviser directing research; lower division standing (3.3 GPA or better)

**Credit Restrictions:** Enrollment is restricted; see the Introduction to Courses and Curricula section of this catalog.

**Repeat rules:** Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of independent study per week

**Additional Details** 

Subject/Course Level: Energy and Resources Group/Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Final exam not required.

## ENE, RES C100 Energy and Society 4 Units

Energy sources, uses, and impacts: an introduction to the technology, politics, economics, and environmental effects of energy in contemporary society. Energy and well-being; energy in international perspective, origins, and character of energy crisis.

## Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

## Additional Details

Subject/Course Level: Energy and Resources Group/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Kammen

Also listed as: PUB POL C184

## ENE, RES 101 Ecology and Society 3 Units

This course introduces students to the many ways in which our lives are intertwined with the ecosystems around us. Topics will include ecological limits to growth, climate change and other threats to biodiversity, the value of ecosystem goods and services, the ecology of disease, ecotoxicology, the evolution of cooperation in ecosystems, industrial ecology, and the epistemology of ecology. Offered alternate years. **Rules & Requirements** 

**Prerequisites:** One college level course, or high school Advanced Placement, in either physics or biology; introductory calculus

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

**Additional Details** 

Subject/Course Level: Energy and Resources Group/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Harte

## ENE,RES 102 Quantitative Aspects of Global Environmental Problems 4 Units

Human disruption of biogeochemical and hydrological cycles; causes and consequences of climate change and acid deposition; transport and health impacts of pollutants; loss of species; radioactivity in the environment; epidemics.

## **Rules & Requirements**

**Prerequisites:** Upper division standing; calculus (MATH 1A-1B or 16A-16B); physics (7A-7B or 8A-8B), chemistry (1A or 4A), biology (1B or 11), or consent of instructor

#### Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

#### **Additional Details**

Subject/Course Level: Energy and Resources Group/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

### Instructor: Harte

ENE, RES 170 Environmental Classics 3 Units

Motivation: What is the history and evolution of environmental thinking and writing? How have certain "environmental classics" shaped the way in which we think about nature, society, and development? This course will use a selection of 20th-century books and papers that have had a major impact on academic and wider public thinking about the environment and development to probe these issues. The selection includes works and commentaries related to these works that have influenced environmental politics and policy in the U.S. as well as in the developing world. Through the classics and their critiques, reviews, and commentaries, the class will explore the evolution of thought on these transforming ideas.

## **Rules & Requirements**

Prerequisites: Upper division standing

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of seminar per week

#### **Additional Details**

Subject/Course Level: Energy and Resources Group/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Kammen, Ray

## ENE, RES 175 Water and Development 4 Units

This course introduces students to water policy in developing countries. It is a course motivated by the fact that over one billion people in developing countries have no access to safe drinking water, three billion do not have sanitation facilities, and many millions of small farmers do not have reliable water supplies to ensure a healthy crop. Readings and discussions will cover: the problems of water access and use in developing countries; the potential for technological, social, and economic solutions to these problems; the role of institutions in access to water and sanitation; and the pitfalls of the assumptions behind some of today's popular "solutions."

## **Rules & Requirements**

Prerequisites: Upper division standing or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 4 hours of seminar per week

**Additional Details** 

Subject/Course Level: Energy and Resources Group/Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

## Instructor: Ray

ENE,RES C180 Ecological Economics in Historical Context 3 Units Economists through history have explored economic and environmental interactions, physical limits to growth, what constitutes the good life, and how economic justice can be assured. Yet economists continue to use measures and models that simplify these issues and promote bad outcomes. Ecological economics responds to this tension between the desire for simplicity and the multiple perspectives needed to understand complexity in order to move toward sustainable, fulfilling, just economies. **Hours & Format** 

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

#### **Additional Details**

Subject/Course Level: Energy and Resources Group/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Norgaard

Also listed as: ENVECON C180

## ENE,RES 190 Seminar in Energy, Environment, Development and Security Issues 3 Units

Critical, cross disciplinary analysis of specific issues or general problems of how people interact with environmental and resource systems. More than one section may be given each semester on different topics depending on faculty and student interest. **Rules & Requirements** 

Prerequisites: Upper division standing and consent of instructor

**Repeat rules:** Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1-3 hours of lecture per week

Summer: 3 weeks - 15 hours of lecture per week

#### **Additional Details**

Subject/Course Level: Energy and Resources Group/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

ENE,RES 198 Directed Group Studies for Advanced Undergraduates 1 - 4 Units Group studies of selected topics.

Rules & Requirements

**Prerequisites:** Upper division standing, plus particular courses to be specified by instructor

**Repeat rules:** Course may be repeated for credit. Course may be repeated for credit when topic changes.

#### Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of directed group study per week

## **Additional Details**

Subject/Course Level: Energy and Resources Group/Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Final exam not required.

ENE,RES 199 Supervised Independent Study and Research 1 - 4 Units Individual conferences. Rules & Requirements

Prerequisites: Enrollment restricted by regulations in General Catalog

**Repeat rules:** Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of independent study per week

Summer: 8 weeks - 1.5-15 hours of independent study per week

**Additional Details** 

Subject/Course Level: Energy and Resources Group/Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Final exam not required.