

## ERG Minor Course List

The Energy and Resources Group will designate one faculty member as The Undergraduate Advisor; all core faculty members will participate in advising students in the minor, just as they do the graduate students. It is The Undergraduate Advisor who will be charged with certifying completion of the minor and to granting exceptions as detailed in the ERG Undergraduate Minor Regulations.

ERG Minor Advisor: Professor John Harte

Questions about the suitability of a course for the ERG Minor may be directed as follows:

Engineering and Natural Science: Professor Dan Kammen

Economics: Professor Richard Norgaard

Social Science: Professor Isha Ray

Environmental Science: Professor John Harte

### **Core Requirements** (both courses are required)

ER 100 Energy and Society (Prof. Kammen, fall, 4 units)

ER 102 Quantitative Aspects of Global Environmental Problems (Prof. Harte, spring, 4 units)

**Elective Courses** (three courses are required, with at least one in social science and at least one in natural science or engineering; one must be an ERG course)

### **Social science** (at least one course)

*Offered by the Energy and Resources Group*

ER C180 Ecological Economics in Historical Context (Prof. Norgaard, spring, 3 units)

ER 273 Research Methods in Social Sciences (Prof. Ray, open to advanced undergraduates by permission, offered spring, 3 units)

*Approved electives offered outside of ERG*

ECON C102 / EEP C102 Natural Resource Economics (4 units)

ECON C171 / EEP C151 Economic Development (4 units, fall)

ESPM 102D Resource and Environmental Policy (4 units, spring)

ESPM 155 Sociology of Natural Resources (4 units, fall)

ESPM 160AC American Environmental and Cultural History (4 units, fall)

ESPM 161 Environmental Philosophy and Ethics (3 units, fall – offered even number years)

ESPM 168 Political Ecology (4 units, spring)

ESPM 169 International Environmental Politics (4 units, fall)

IDS 100AC Technology and the American Experience (4 units)

### **Natural science and engineering** (at least one course)

*Approved electives offered outside of ERG*

CivEng 103 Hydrology (3 units)

CivEng 107 Climate Change Mitigation (3 units, spring)

CivEng 111 Environmental Engineering (3 units, f,sp)

Civ Eng 114 Environmental Microbiology (3 units, fall)

CivEng 115 Water Chemistry (3 units, fall)

EPS 105 Hydrogeology (3 units)

EPS 117 Geomorphology (4 units)

EPS C129 / ESPM C129 Biometeorology (3 units,fall)

EPS C180 / ESPM C180 Air Pollution (3 units, fall)

ESPM 111 Ecosystem Ecology (3 units, spring)

ESPM 112 Microbial Ecology (3 units, spring)

ESPM 120 Soil Characteristics (3 units, fall)

ESPM 131 Soil Microbial Ecology (3 units, spring)

ESPM 140 General Entomology (4 units, spring)

ESPM 143 Watershed Hydrology (3 units, spring)

IB 106A Physical and Chemical Environment of the Ocean (4 units, spring)

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IB 152 Environmental Toxicology (4 units, spring)  
IB 153 Population and Community Ecology (3 units, fall)  
IB 157L Ecosystems of California (4 units, fall)

### Other

*Offered by the Energy and Resources Group*

ER 170 Environmental Classics (every other fall, 3 units)  
ER 190 Seminar in Energy, Environment, Development and Security Issues. (Staff, 3 units)  
ER 198. Directed Group Studies for Advanced Undergraduates (must be taken for  $\geq 3$  units) - DeCAL courses do not count for this requirement.  
ER 199. Supervised Independent Study and Research (must be taken for  $\geq 3$  units)

*Offered outside ERG*

CRP 119 Planning for Sustainability (3 units)  
EPS 170AC / LS 170AC Crossroads of Earth Resources and Society (4 units)  
EnvSci 125 Environments of the San Francisco Bay Area (3 units, spring)  
ESPM 118 Agricultural Ecology (3 units, fall)  
ESPM C130/Geog C136 Water in Terrestrial Environment (3 units)

## ERG COURSE DESCRIPTIONS

### 1. Required Courses for the Minor

#### ER 100 Energy and Society

Energy is a fundamental resource for society, the control of which both reflects and shapes interactions within society, and between humans and the natural environment. Addressing the use and the impacts of energy systems requires an interdisciplinary understanding that explores the scientific, technical, economic, social, political and environmental opportunities and impacts of our energy system.

In this course, students develop an understanding and working knowledge of energy technologies, policies, and options gained by learning to understand, critique and integrate tools and perspectives from anthropology, cultural and ethnic studies, economics, engineering, physics, politics, sociology Through such analysis, the different opportunities and impacts of energy systems that exist within and between groups defined by national, regional, household, ethnic, gender distinctions are revealed. Analysis of the range of current and future energy choices is stressed, as well as the role of energy in determining local environmental conditions, and the global climate. The analytic strategies and approaches developed in this course are applicable to other interdisciplinary problems as well.

#### *Course Goals*

This course is designed to provide the student with the methods, tools and perspectives to understand, critique, and ultimately influence the management of technical, economic, and policy choices regarding the options for energy generation and use. It focuses equally on the technical, socioeconomic, political, and environmental impacts of energy.

Typically, students will examine the full 'life cycle' of energy, from the stage of raw materials, or inputs, to generation, conversion, distribution, consumption, recycling, waste, impacts, and ethnic, racial, gender, and economic inequities. Over the semester students take a roughly chronological tour of the major fuel types used in human civilization. In the first third of the course, students are introduced to the key analytic tools necessary to assess the issues; following the development of each student's toolbox, students begin a broad-ranging analysis of the energy resource, combustion or conversion processes, application, waste, economic, social, political, cultural and environmental impacts and options associated with these fuels and with the changing mix of fuels used within and across societies around the globe The challenge for students is developing the skill of integration, that is not simply learning and applying methods from very diverse disciplines, but more importantly understanding how and when different types of analysis, disciplinary and political perspectives, and "voices" are heard, unheard, ignored, or discredited.

## ERG Minor Course List

### **ER 102 Quantitative Aspects of Global Environmental Problems**

Increasing human numbers, accelerating rates of economic consumption, and an ever more potent technological capacity to alter the natural environment has led to new and enhanced environmental threats to the well being of humankind at regional and global spatial scales. While the threatened environmental systems and the mechanisms of damage are highly complex, it is possible to obtain a working understanding of the nature of the problems by starting with the fundamental principles of biology, chemistry and physics and learning how they have contributed to insights in ecology, hydrology, meteorology and other integrative scientific fields. The emphasis in this course, which focuses on global- and continental-scale problems such as global climate change, is the integration and application of scientific disciplines toward an understanding of the origins and consequences of such problems. Through the development of skills in estimation and simple model building and analysis, students will achieve greater intuition into the nature of complex systems and the ways they respond to disturbance.

#### *Course Goals*

To apply the basic principles of all the relevant natural sciences to the analysis of human influence on environmental conditions and processes at continental to global scale, and to learn how to build and work with simple yet useful quantitative models to enhance understanding of complex environmental systems.

#### *Subject Matter*

Topics covered include dimensions of the physical world and of human modifications of it; techniques of estimation and back of the envelope calculations; box models of environmental stocks and flows applied to biogeochemistry, hydrology, and toxicology; feedback in complex environmental systems; chemical equilibria in the environment; nutrient cycles and their disruptions; acid deposition and its consequences; climate change and its consequences; stratospheric ozone depletion; sources, fate and effects of toxic substances in the global environment; radioactivity and radiation; epidemics; biodiversity and its diminution; carrying capacity and human population growth.

## **2. Electives**

Students are required to take three upper division courses from the list approved by the ERG faculty. Students take one course from the social sciences and one course from the natural sciences or engineering. A third course can be chosen in either of these areas, or from the category designated as "other". The choice of electives within the minor 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 in two ways: 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. At least one of the electives must be a course offered by the Energy and Resources Group.

### **ER 198 and 199:**

**ER 198. Directed Group Studies for Advanced Undergraduates.** Course may be repeated for credit. Hours to be arranged. Must be taken on a passed/not passed basis. Prerequisites: Upper division standing, plus particular courses to be specified by instructor. Group studies of selected topics. (3 units)

**ER 199. Supervised Independent Study and Research.** Course may be repeated for credit. Hours to be arranged. Must be taken on a passed/not passed basis. Prerequisites: Enrollment restricted by regulations in General Catalog. Individual conferences. (3 units)