

Environmental Studies

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Program of Study

The Environmental Studies Program addresses the full range of environmental issues—scientific, political, social, and cultural. How do humans use the natural world and how does human activity impact on its natural legacy? How shall we best interact with our environment both for ourselves and on behalf of future generations and the web of life?

To explore these far-reaching questions, the Environmental Studies Program offers a curriculum that is both broadly multidisciplinary and focused. The goal is to build mastery of topics of special concern on a general environmental education. Our approach includes not only didactic coursework, but also special seminars and individual senior research papers. The program is sponsored by the New Collegiate Division, a home for innovations in interdisciplinary undergraduate education.

Summary of Program

Students seeking to concentrate in Environmental Studies should contact the program chair before the end of their second year. Their plan of study will be tailored to their individual interests, guided by the program chair and their College adviser. Below are suggestions of some appropriate courses.

General Education. Any undergraduate interested in the humanities and social sciences can satisfy the College general education requirements in the physical, biological, and mathematical sciences with the six-quarter Environmental Sciences sequence, ENST 12100-12200-12300-12400-12500-12600. This sequence is not required of concentrators nor is it appropriate for students planning advanced scientific study. Other relevant introductory science courses include Chemistry 11101-11201-11301; Geophysical Sciences 13300 or 13400; or a biology sequence that includes ecology. Third and fourth year students who are not Environmental Studies concentrators may wish to consider a relevant Big Problems course, such as ENST 24400: Is Development Sustainable?

The Concentration. Environmental Studies concentrators can take the required introductory course, ENST 21201: Human Impact on the Environment, in their second, third, or fourth year. They must also take courses in economics and statistics in addition to two relevant social science and two relevant biological or physical science courses beyond their general education requirements (see below).

Relevant Biological and Physical Sciences Courses: BIOS 23246, 23351, 23406; GEOS 23900 (=CHEM 21000); and STAT 22000.

Relevant Social Sciences Courses: ENST 21800, 22000, 23100, 23600, 24100, 24300, 24700, and 24900.

Environmental Studies Seminar. Students and faculty associated with the program meet periodically to hear talks by visiting scholars. Senior papers are also presented in this forum. Environmental Studies concentrators are expected to participate in these events without course credit.

B.A. Paper. During their third year, Environmental Studies concentrators should begin to consider topics and a faculty adviser for their senior thesis (B.A. paper). Guidance is available from the program chair and the B.A. preceptor. By the ninth Monday of the Spring Quarter of the third year, each student should submit to the program chair a brief plan for their B.A. project, identifying the topic, an adviser, and a list of relevant summer readings. Summer internships are often ideal starting points for B.A. projects. Students generally work on their senior thesis throughout their fourth year under the guidance of their faculty advisers and the B.A. program preceptor. These theses are submitted to readers and presented orally in the Environmental Studies seminar at the end of the Spring Quarter.

B.A. Colloquium. Students preparing their B.A. papers are expected to enroll in the B.A. Colloquium during the Autumn and Winter Quarters. This two-quarter course, taken *P/F*, is intended to assist students with the research and writing of their papers.

Summary of Requirements

Concentration	1	ENST 21201
	1	ECON 19800 or higher
	1	course in statistics (ENST 12500 or higher)
	2	additional relevant social sciences courses
	2	additional relevant natural sciences courses
	3	additional courses in the area of emphasis
	<u>1</u>	B.A. Colloquium (ENST 29100 or 29200)
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Grading. Courses required for the concentration may not be taken on a *P/F* basis without consent of the program chair.

Honors. Students may be nominated for graduation with special honors on the basis of the excellence of their senior research papers if their overall grade point average is higher than 3.25. Students seeking honors must locate an additional reader for their senior papers in addition to their adviser and the program chair.

Faculty

D. Archer, M. Arsel, T. Clark, M. Conzen, G. Eshel, J. Frederick, A. Gugliotta, H. Henderson, A. Hunter, A. Kolata, A. McCright, R. Meyers, M. Mikesell, J. Opie, R. Pierrehumbert, S. Shaikh, T. Steck, M. Stein, A. Turkewitz.

Courses: Environmental Studies (ENST)

L refers to courses with a required laboratory.

10400. Environmental Ecology. (=BIOS 13107, NTSC 10400) *PQ: NTSC 10300.* This course emphasizes basic scientific understanding of ecological and evolutionary principles that relate most closely to the ways humans interact with their environments. Topics include population growth, adaptation, and ecosystem structure and function. We also discuss the regulation and consequences of biodiversity. *Discussion required. E. Larsen. Winter.*

11101-11201-11301. General Chemistry I, II, III: Variant A. (=CHEM 11101-11201-11301) *PQ: Good performance on the mathematics or calculus placement test. The first two courses in this sequence meet the general education requirement in the physical sciences. Variant A emphasizes the role of chemical and physical processes in the environment, especially in water and in the atmosphere. S. Sibener, Autumn; T. Oka, Winter; D. Levy, Spring. L. M. Zhao. Autumn, Winter, Spring.*

12100. Atmospheric Chemistry and Air Quality. (=NTSC 12100, PHSC 13500) *PQ: MATH 10600, or placement in 13100 or higher, or consent of instructor. Courses must be taken in sequence.* This course considers: (1) the chemical, physical, and radiative processes that determine the composition of the atmosphere; and (2) the effects that increasing global industrialization and agriculturization are having upon the atmosphere. Particular attention is given to stratospheric ozone depletion, the chemistry of the global troposphere, the quality of urban air throughout the world, and the formation of acid precipitation. The extent to which locally released pollutants affect the atmosphere on a global scale is addressed. *J. Frederick. Autumn. L.*

12200. Cells in their Environment. (=BIOS 10300, NTSC 12200) *PQ: ENST 12100 or consent of instructor. This course is an alternative to BIOS 10100 for students enrolled in the Environmental Sciences sequence.* We consider the molecular basis of life. Our focus is on the evolved structure, function, and organization of cells and their constituents. We also take up how cells store and express information, obtain and use energy, and interact with their natural environment. *T. Steck, A. Turkewitz. Winter. L.*

12300. Global Warming: Understanding the Forecast. (=GEOS 13400, NTSC 12300, PHSC 13400) *PQ: MATH 10600, or placement in MATH 13100 or higher, or consent of instructor required; some knowledge of chemistry or physics helpful.* This course presents the science behind the forecast of global warming to enable the student to evaluate the likelihood and potential severity of anthropogenic climate change in the coming centuries. It includes an overview of the physics of the greenhouse effect, including comparisons with Venus and Mars; an overview of the carbon cycle in its role as a global thermostat; predictions and reliability of climate model forecasts of the greenhouse world; and an examination of the records of recent and past climates, such as the glacial world and Eocene and Oligocene warm periods. *D. Archer, R. Pierrehumbert. Spring. L.*

12400. Organisms and Ecosystems in the Environment. (=BIOS 10301, NTSC 12400) *PQ: BIOS 10100 or 10300, or consent of instructor. This course qualifies as a topical course in the biological sciences general*

education requirement or as the second biological sciences course in the Environmental Sciences sequence. This course examines the interactions between organisms and their environments. Topics include reproduction, nutrition, disease, population, conservation, and interactions between species. Organismal biology and ecology are related to environmental problems (e.g., overpopulation, biodiversity loss, pollution) from a scientific perspective. *A. Hunter. Autumn.*

12500. Quantitative Methods in Environmental Science. (=NTSC 12500, STAT 12500) This course studies mathematical, statistical, and computational approaches to scientific issues raised previously in this sequence. Three principal tools are: probability theory as a way to quantify uncertainty, the analysis of observations of natural processes that vary across time, and the application of computer simulations to understanding such processes. *V. M. Dukic. Winter.*

12602. Planetary Consequences of Human Diet (= NTSC 12602). *PQ: ENST 12500 or consent of instructor.* Eating is one of the human activities with the largest planetary environmental footprint. Consequently, and because various foods vary enormously in their environmental cost, individual choices one makes about such an apparently mundane topic as diet are collectively among the most prominent and influential political decisions one can make. In this course, we first survey various large-scale consequences of production of various food items, agricultural practices and subsidy structure of various food products. We then follow various food choices in details all the way back from our plate to their elemental building blocks, analyze each in terms of inputs such as water, surface area, air quality, etc. The method of Linear Programming is introduced (mostly heuristically) and employed in the comparison of various dietary choices. Throughout the course, the overt, as well as the carefully hidden, political aspects of food production are discussed. *G. Eshel. Spring.*

13106. The Hungry Earth: Light, Energy, and Subsistence (=BIOS 13106). *PQ: BIOS 10100.* The theme of the class includes a consideration of the continuing erosion of the resources of the Earth by the persisting pressures of a growing human population, which makes a broad knowledge and appreciation of biology essential. Discussion includes the principles of energy conversion by plants as primary producers, the evolution of the structures and mechanisms involved in energy conversion, the origin of crop plants, improvements of plants by conventional breeding and genetic engineering, and the interactions of plants with pathogens and herbivores. *M. Ruddat. Winter.*

13300. The Atmosphere. (=GEOS 13300) *PQ: MATH 13200 or consent of instructor.* This course provides an introduction to the physics, chemistry, and phenomenology of the Earth's atmosphere with an emphasis on the role of the atmosphere as a component of the planet's life support system. Topics include: (1) atmospheric composition, evolution, and structure; (2) solar and terrestrial radiation; (3) the role of water in atmospheric processes; (4) winds, the global circulation, and weather systems; and (5) atmospheric chemistry and pollution. We focus on the mechanisms by which human activity can influence the atmosphere and on interactions between atmosphere and biosphere. *J. Frederick. Winter.*

14200-14300. Paleoclimate, Earth Systems, and the Emergence of Humankind. (=PHSC 13200-13300) *PQ: MATH 10600 or placement into MATH 13100 or higher. Must be taken in sequence.* This two-quarter sequence (Winter and Spring Quarters) aims to examine the complex natural systems that have determined Earth's environment during the time when *Homo sapiens* emerged as a species and began to alter the environment in the process of building settlement systems. Particular effort is devoted to understanding the physical processes that govern the climate system, including aspects of meteorology, oceanography, surface and groundwater hydrology, solar physics, isotopic geochemistry in ice core analysis, and glaciology. The view of human history provided by archaeology and by historical records will guide the analysis of the Earth's physical systems to special "hot spots" of scientific importance. The sequence is intended to prepare students to apply the insights and worldviews of physical science to the understanding of history and current world events.

14200. The Dynamic Environment: Global Systems and Climate during the Emergence of Humankind. Topics include the little ice age, solar physics, radiation balance of the earth relative to the sun, greenhouse effect, Greenland ice-core geochemistry, ice-age Milankovitch theory, glacial geology, volcanoes and their effect on weather and climate, volcanic hazards to settlement, precipitation systems, El Niño and the Indian monsoon, groundwater hydrology, rivers and fluvial systems, and deltaic sedimentation patterns. Historical context includes the journey of humans from Africa to Australia and the Americas, Viking settlement of Greenland, and Middle East conflict over water resources. *D. MacAyeal. Winter. L.*

14300. Settlement Systems, the Management of Nature, and the Emergence of Humankind within a Dynamic Environment. *PQ: ENST 14200.* Topics include the fossil record of hominid evolution, drying climates of Africa, the Younger Dryas event, catastrophic environmental change in the Black Sea associated with sea-level rise, physics and chemistry of irrigation and water management, hydroelectric power generation, desert and Aeolian geomorphology, desertification, deforestation, primitive and advanced metallurgy as a basis for human culture, geoarchaeological methods, soil development, land degradation, sea-level rise, oil and petroleum production, and environmental catastrophes in antiquity. Historical context includes the settlement of Mesopotamia and the Nile; Pre-Columbian settlement of the Andes; dams and irrigation projects in Turkey, Syria, and Iraq; deforestation of Lebanon; and the oil shortage of the 1970s. *D. MacAyeal, Staff. Spring. L.*

20500. Introduction to Population. (=SOCl 20122/30122) This course provides an introduction to the field of demography, which examines the growth and characteristics of human populations. The course provides an overview of our knowledge of three fundamental population processes: fertility, mortality, and migration. We also cover marriage, cohabitation, marital disruption, aging, and population and environment. In each case we examine historical trends. We also discuss causes and consequences of recent trends in population growth, and the current demographic situation in developing and developed countries. *L. Waite. Winter.*

20600. Population and Development. (=SOCI 20124/30124) This course is a broad overview of demographic issues in the “less developed regions of the world.” Demographic patterns and change are discussed with a particular interest in the relationship between socioeconomic development and demographic factors. How do social and economic changes affect population dynamics? Is there a social or an economic optimum rate of population change? We discuss how demographic thought and policies have evolved on these issues in light of the empirical evidence. *P. Heuveline. Autumn.*

21201. Human Impact on the Environment. (=NCDV 21200) We analyze the impact of the human enterprise on the natural world that sustains it. Topics include human population dynamics, the role of economic and industrial activity in human well-being, our use of natural resources, biodiversity, sustainable development, and the role played by cultural institutions and values. *T. Steck. Autumn.*

21800. Economics and Environmental Policy. (=PBPL 21800) *PQ: ECON 19800 or higher.* This course combines basic microeconomic theory and tools with contemporary environmental and resources issues and controversies to examine and analyze public policy decisions. Theoretical points include externalities, public goods, common-property resources, valuing resources, benefit/cost analysis, and risk assessment. Topics include pollution, global climate changes, energy use and conservation, recycling and waste management, endangered species and biodiversity, nonrenewable resources, congestion, economic growth and the environment, and equity impacts of public policies. *S. Shaikh. Spring.*

22000. The Anthropology of Development. (=ANTH 22000/35500) This course applies anthropological understanding to development programs in “underdeveloped” and “developing” societies. Topics include the history of development; different perspectives on development within the world system; the role of principal development agencies and their use of anthropological knowledge; the problems of ethnographic field inquiry in the context of development programs; the social organization and politics of underdevelopment; the culture construction of “well-being”; economic, social, and political critiques of development; population, consumption, and the environment; and future scenarios of development. *A. Kolata. Spring.*

22800. Environmental Sociology. (=SOCI 20132/30132) This course applies pertinent principal theories and paradigms of sociology to an analysis of major factors affecting human impact on the environment, including population growth, industrial technology, capitalism, and systems of values and beliefs. Particular issues that will be covered include energy consumption, quality of life, carrying capacity, sustainable development, environmental justice, and global environmental change. *A. McCright. Winter.*

23100. Environmental Law. (=LLSO 23100, PBPL 23100) *PQ: Third- or fourth-year standing, or consent of instructor.* This lecture/discussion course examines the development of laws and legal institutions that address environmental problems and advance environmental policies. Topics include the common law background to traditional environmental regulation, the explosive growth and impact of federal environmental laws in the second half of the twentieth century, regulations and the urban environment, and the

evolution of local and national legal structures in response to environmental challenges. *H. L. Henderson. Autumn.*

23500. Political Sociology. (=PBPL 23600/33600, PLSC 23200, SOCI 20106/30106) *PQ: Prior general social sciences course.* This course provides analytical perspectives on citizen preference theory, public choice, group theory, bureaucrats and state-centered theory, coalition theory, elite theories, and political culture. These competing analytical perspectives are assessed in considering middle-range theories and empirical studies on central themes of political sociology. Local, national, and cross-national analyses are explored. *T. Clark. Spring.*

23600. The Environment in U.S. History. (=HIST 19000, LLSO 23600) Contemporary environmental issues are deeply rooted in a complex history, often ignored or misunderstood. This course examines human engagement with the natural world in what is now the United States. We explore the interaction of environmental change with human activities and ideologies that reflect broader themes in American culture. *A. Gugliotta. Winter.*

23700. Technology and Environment in History. (=HIST 25200, HIPS 23800) This course examines historical case studies on the interaction of human artifice and natural environments. We analyze the cultural meanings and environmental effects of particular technological regimes. Case studies include topics as diverse as ancient irrigation, slave labor systems, Renaissance alchemy, and nuclear energy. *A. Gugliotta. Spring.*

23900. Environmental Chemistry. (=CHEM 21000, GEOS 23900) *PQ: CHEM 11101-11201 or equivalent, and prior calculus course.* The focus of this course is on the fundamental science underlying issues of local and regional scale pollution. In particular, lifetimes of important pollutants in the air, water, and soils are examined by considering the roles played by photochemistry, surface chemistry, biological processes, and dispersal into surrounding environment. Specific topics include urban air quality, water quality, long-lived organic toxins, heavy metals, and indoor air pollution. Control measures are also considered. *D. Archer. Spring. L.*

24100. The Environment in U.S. Politics. (=NCDV 24100, PBPL 22600) From genetically modified foods to fossil fuels, from environmental justice to nuclear waste storage, environmental issues pervade American politics. Guided by leading theories on political power and behavior, we examine how major actors influence environmental policy, including the scientific and business communities, social movements, the public, and policymakers themselves. *A. McCright. Autumn.*

24300. International Development: Theory, Politics, and Policy. Why are some countries rich and some poor? How, if at all, can developed nations and international organizations promote development around the world? What are the power structures defining the meaning and implementation of international development? This course seeks answers to these questions. It provides a broad, interdisciplinary introduction to development studies. Topics include theories of economic development, Bretton Woods institutions, decolonization, gender, and human rights. *M. Arsel. Winter.*

24400. Is Development Sustainable? (=BPRO 23400, HIPS 23400, NCDV 27300, PBPL 24400) *PQ: Third- or fourth-year standing.* This is a discussion course for students without a background in environmental issues. Its aim is to grapple with the “big problem” of sustainable development. We

analyze problematical issues underlying population growth; resource use; environmental transformation; and the struggle of developing nations through a consideration of economic, political, scientific, and cultural institutions and processes. *T. Steck, M. Arsel. Spring.*

24700. Environmental Policy and Decision Making. (=LLSO 28900, PBPL 22500) This course considers theories concerning the origins of environmental problems and policy options for their resolution. It also analyzes public opinion concerning the environment, theories of the relationship of environmental knowledge and attitudes to environmental behavior, and how environmental education might increase the effectiveness of public participation programs and democratic capacity. *R. Meyers. Winter.*

24900. Global Environmental Politics. (=NCDV 21100, PBPL 24300) This course provides an introduction to global environmental politics. We examine several environmental issue areas to identify the roles, interests, and behavior of main actors such as states, international organizations, NGOs, and the business community. Students are introduced to major contemporary debates relating environmental issues to trade liberalization, security, social justice, and human rights. They are also provided with analytical tools for further exploration of environmental issues. *E. Tennant. Spring.*

25100. Ecological Applications to Conservation Biology. (=BIOS 23351, ECOL 31300) *PQ: Completion of the general education requirement for the biological sciences and consent of instructor.* We focus on the contribution of ecological theory to understanding current issues in conservation biology. The course emphasizes quantitative methods and their use for applied problems in ecology, such as the design of natural reserves, the risk of extinction, the impact of harvesting, the dynamics of species invasions, and the role of species interactions. Course material is drawn mostly from the current primary literature. *Two Saturday field trips and computer modeling labs are in addition to scheduled class time. J. Bergelson, C. Pfister. Autumn. L.*

25500. Biogeography. (=BIOS 23406/35500/45500, ECEV 45500, GEOG 25500/35500) *PQ: Completion of the general education requirement for the biological sciences or consent of instructor.* This course examines factors governing the distribution and abundance of animals and plants. Topics include patterns and processes in historical biogeography, island biogeography, geographical ecology, areography, and conservation biology, such as the design and effectiveness of nature reserves. *B. Patterson (odd years, lab), L. Heaney (even years, discussion). Winter.*

25900. Cultural Geography. (=GEOG 20100/30100) This course is an examination of the two main concerns of this field of geography: (1) the logic and pathology revealed in the record of the human use and misuse of the Earth, and (2) the discordant relationship of the world political map with more complicated patterns of linguistic and religious distribution. *M. Mikesell. Winter.*

26100. Roots of the Modern American City. (=GEOG 26100/36100) This course traces the economic, social, and physical development of the city in North America from early industrialization to the present. Emphasis is on

evolving urban systems and the changing spatial organization of people and land use. *All-day Illinois field trip required. M. Conzen. Autumn.*

26500. Environmental Economics. (=ECON 26500, PBPL 32800) *PQ: ECON 20100.* This course applies theoretical and empirical economic tools to a number of environmental issues. The broad concepts discussed include externalities, public goods, property rights, market failure, and social cost-benefit analysis. These concepts are applied to a number of areas including nonrenewable resources, air pollution, water pollution, solid waste management, and hazardous substances. Special emphasis is devoted to analyzing the optimal role for public policy. *S. Shaikh. Winter.*

27400. Principles of Epidemiology. (=HSTD 30900) Epidemiology is the study of the distribution and determinants of health and disease in human populations. This course introduces the basic principles of epidemiologic study design, analysis, and interpretation through lectures, assignments, and critical appraisal of both classic and contemporary research articles. The final project is to write a brief, critical review of the epidemiologic literature on a topic of the student's choice. *K. Pickett. Autumn.*

28000. Environmental Philosophy and Ethics. (=LLSO 29300) This course reviews basic ethical and value theories and surveys a range of environmental ethics and issues, including animal rights. It links ethical theory to action by focusing on public values and attitudes, their relationship to environmental behavior, and how environmental education may contribute to increasing environmental consideration and democratic capacity. *R. Meyers. Spring.*

28200. Reading American Environmental Classics. (=ENGL 26400) Both historic Brief critical essays by students of both historic and modern environmental classics serve as the basis for class discussion. The emphasis is on historical wilderness and so-called "ordinary landscapes." Possible authors include Crèvecoeur, Emerson, Thoreau, Powell, Eiseley, Muir, Leopold, Carson, Abbey, and Dillard. We seek to define and explore what "American Environmental Classic" means in historical and contemporary terms. *J. Opie. Autumn.*

29100. B.A. Colloquium 1. *PQ: Open only to Environmental Studies concentrators with fourth-year standing. Must be taken for P/F grade.* This two-quarter colloquium will assist concentrators in conceptualizing, researching, and writing their B.A. theses. It is required for all concentrators (unless they are excused by the program chair). *D. Aftandilian. Autumn.*

29200. B.A. Colloquium 2. *PQ: Open only to Environmental Studies concentrators with fourth-year standing. Must be taken for P/F grade.* This two-quarter colloquium will assist concentrators in conceptualizing, researching, and writing their B.A. theses. It is required for all concentrators (unless they are excused by the program chair). *D. Aftandilian. Winter.*

29700. Reading Course. *PQ: Consent of faculty supervisor and program chair. Students are required to submit the College Reading and Research Course Form. Must be taken for P/F grade. Autumn, Winter, Spring.*

29900. Senior Paper Preparation. *PQ: Open only to concentrators with fourth-year standing. Consent of faculty supervisor and program chair. Students are required to submit the College Reading and Research Course Form. Must be taken for P/F grade. Designed for fourth-year Environmental Studies students to be used for the preparation of the required senior paper. Autumn, Winter, Spring.*