INTERDISCIPLINARY GRADUATE PROGRAM IN ENVIRONMENT AND RESOURCES (IPER)

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Courses given in IPER have the subject code IPER. For a complete list of subject codes, see Appendix.

Over the last 30 years, environmental and resource investigations have focused on problems with acute local impacts, such as urban air pollution, pesticide use, or groundwater depletion. These problems have been addressed principally at the national and local level through research and policies that address specific media such as air or water; threats such as toxic chemicals; or resources such as forests or wetlands. More global challenges such as climate change and biodiversity loss pose fundamental threats to the health of the planet and human societies. Solutions to these problems must be multifaceted, addressing the interactions among threats and resources, and engaging diverse actors, including academia, national governments, international institutions, business, and civil society. The research and understanding necessary to devise such solutions thus must be interdisciplinary, integrating the analytical tools of diverse fields to yield new insights and promising responses.

The Interdisciplinary Graduate Program in Environment and Resources (IPER) responds to these challenges by leveraging Stanford's faculty strengths in disciplines ranging from ecology and engineering to law and economics, all of which are increasingly directed toward interdisciplinary, solution-oriented research and teaching that encompasses collaborative efforts that cross departmental boundaries.

Interdisciplinary work requires that individuals and groups become familiar with the concepts, methods, data, and analyses of several disciplines in order to focus research questions more sharply. It requires the integration of multidisciplinary knowledge in the formulation of research questions and hypotheses, and in the execution and analyses of results. Students in the IPER program learn through interactions with a cohort of students and a dedicated faculty who influence each other's ways of thinking and questioning.

FOUNDATION AND FLEXIBILITY

IPER students construct an integrative graduate curriculum through shared foundational study and flexibility in a research course. Students in the program are expected to make significant progress in each of three intellectual areas:

1. The linkages between physical and biological systems, and understanding the potential environmental consequences associated with the dynamics or evolution of these joint systems.
2. The interplay between human activities and the Earth system, and how human influence on the environment, such as through methods of production or patterns of consumption, is affected by social and economic institutions, legal rules, and cultural values, and how resources and environment in turn affect human actions and decision making.
3. Skills for gauging the potential impacts of alternative public policy options for dealing with environmental problems, for evaluating such policy alternatives according to various normative criteria, and for integrating scientific research into policy formulation.

The program's flexibility enables students to focus on their areas of greatest interest. For example, a student with a strong interest in the relationship between commercial fishing and coral reef habitat might concentrate on biology, international relations, and economics; a student aiming to understand the environmental impacts from agricultural

production decisions might focus on the interplay among economics, biogeochemistry, and hydrology; and a student interested in the design and evaluation of policies to curb emissions of greenhouse gases might learn about scientific, technological, and economic issues, while gaining skills in policy analysis, evaluation, and implementation.

RESEARCH HIGHLIGHTS

Research is the cornerstone of IPER. Faculty and graduate students are engaged in interdisciplinary research projects such as studying the effects and constraints of agricultural intensification and urbanization in the Yaqui Valley of Sonora, Mexico, and spatial analysis of land use changes in Vietnam. Students in IPER have the opportunity to work on existing projects or develop their own research directions and topics. Student research addresses issues such as the science and policy of global climate change, environmental quality, regional security, the mapping and valuation of ecosystem services, energy development, agricultural intensification and variability, characterization and effects of land use change, conservation finance, and natural resource management. Examples of research projects include:

1. Investigating ecosystem services in the Hawaiian countryside, through study of the sustainable management of native hardwood on private lands by creating financial incentives to make biodiversity conservation economically attractive to landowners.
2. Evaluating electric power sector development in China and India, and the potential for international policy mechanisms to steer these countries toward less CO_2-intensive growth paths.

For additional student research projects, see http://iper.stanford.edu/research.For more information about integrative environmental research at Stanford, see the Woods Institute for the Environment web site at http://environment.stanford.edu.

GRADUATE PROGRAMS

The University's basic requirements for the M.S. and Ph.D. degrees are discussed in the "Graduate Degrees" section of this bulletin.

MASTER OF SCIENCE

JOINT DEGREE PROGRAM

Students enrolled in a Stanford professional degree program in the Graduate School of Business or the School of Law are eligible to apply for admission to the joint Master of Science in Environment and Resources degree program. Completion of the program results in the award of joint M.B.A. and M.S. in Environment and Resources degrees, or joint J.D. and M.S. in Environment and Resources degrees. The joint M.B.A./M.S. degree requires a total of 129 units (84 for the M.B.A. and 45 for the M.S.) to be completed over approximately eight academic quarters. The joint J.D./M.S. degree allows up to 30 semester or 45 quarter units to count towards both degrees, potentially allowing the joint degree to be completed in three academic years depending upon when a student enters the joint degree program and upon the courses chosen. Students in the joint degree program must take two core courses: IPER 310, Environmental Forum Seminar, and IPER 335, Environmental Science for Managers and Policy Makers. Students also complete at least eight other graded courses at the 100 level or higher, of which at least two must be at the 200 level, while maintaining a 'B' average. Law students are also required to take the Environmental Law workshop. Directed research and independent study may count for a maximum of 4 units for joint M.S. students. A maximum of 12 units from the student's professional school, including environmental law workshop units for Law students, may be applied toward the IPER M.S. A list of approved professional school courses can be found on the IPER web site: http://iper.stanford.edu. MBA students must focus their final projects in the approved GSB classes on an environmental or natural resource topic to be counted toward the MS. Students design their elective courses around one or more of the program's focal areas chosen to complement but not duplicate their primary professional degree program at Stanford. The focal areas are: culture and institutions; economics and policy analysis; engineering and technology; and natural sciences. These focal areas are not declared on Axess; they do not appear on the transcript or diploma. While science or mathematics background is not required for acceptance, quantitative skills are necessary for many courses; students may be required to take additional course work in quantitative methods.

The student's program of study is subject to the approval of the student's advising team, consisting of at least one faculty member from the applicable professional school and one faculty member from the student's IPER focal area. The joint degree is conferred when the requirements for both the IPER M.S. and the professional degree programs have been met. For application information, see http://iper.stanford.edu/apply/app_processMS.html.

DUAL DEGREE

Only students in the School of Medicine may apply to pursue a dual degree, which requires that they meet requirements for the M.D. and complete an additional 45 units for the M.S. in Environment and Resources. No course units may be counted towards both degrees. Completion of the M.S. is anticipated to require three quarters in addition to the quarters required for the M.D.

Students in the dual degree program must take two core courses: IPER 310, Environmental Forum Seminar; and IPER 335, Environmental Science for Managers and Policy Makers. Students also complete at least eight other graded courses at the 100 level or higher, of which at least two must be at the 200 level, while maintaining a 'B' average. Directed research and independent study may count for a maximum of 8 of these units for dual M.S. students. Students design their elective courses around one or more of the program's focal areas chosen to complement but not duplicate their primary professional degree program at Stanford. The focal areas are: culture and institutions; economics and policy analysis; engineering and technology; and natural sciences. These focal areas are not declared on Axess; they do not appear on the transcript or diploma. While science or mathematics background is not required for acceptance, quantitative skills are necessary for many courses; students may be required to take additional course work in quantitative methods.

The student's program of study is subject to the approval of the student's advising team, consisting of at least one faculty member from the applicable professional school and one faculty member from the student's chosen focal area within IPER. The degrees are conferred separately when the respective requirements have been completed. For application information, see http://iper.stanford.edu/apply/app_processMS.html.

MASTER OF SCIENCE

In exceptional circumstances, IPER offers a Master of Science degree for students in IPER's Ph.D. program who opt to complete their training with a M.S. degree and not pursue the Ph.D. degree. Admission directly to the stand-alone M.S. program is not allowed.

M.S. course work totals at least 45 units at or above the 100-level, of which 18 units should be at or above the 200-level. Students must complete: IPER 310, Environmental Forum Seminar, and IPER 335, Environmental Science for Managers and Policy Makers; or IPER 310, Environmental Forum Seminar, IPER 320, Designing Environmental Research, and IPER 330, Research Approaches for Environmental Problem Solving.

Students plan a sequence of courses with a focus in an area of study such as: culture and institutions; economics and policy analysis; engineering and technology; or natural sciences.

A program proposal, signed by the student's program adviser and approved by the chair of the student's M.S. committee, must be filed within the first four weeks of the first quarter of M.S. degree enrollment. Students may take no more than 6 units credit/no credit and must maintain at least a 'B' average in all courses taken for the M.S. degree. The M.S. degree does not have an M.S. with thesis option. Students may write a M.S. thesis, but it is not formally recognized by the University.

DOCTOR OF PHILOSOPHY

1. The student works with a faculty advising team to design a course of study that allows the student to develop and exhibit: a) familiarity with analytical tools and research approaches for interdisciplinary problem solving, and a mastery of those tools and approaches central to the student's thesis work; b) interdisciplinary breadth in each of four

focal areas: culture and institutions; economics and policy analysis; engineering and technology; and natural sciences; and c) depth in at least two distinct fields of inquiry. The advising team has primary responsibility for ensuring the adequacy of the course of study. The IPER faculty advising team is comprised minimally of two lead advisers, each representing a field of inquiry chosen by the student. At a minimum, the student meets with these advisers quarterly during the first year, culminating in Spring Quarter with a big picture advising meeting, and at least annually thereafter. Depth in the fields of inquiry is monitored by a student's two lead faculty advisers who must certify that a) the two fields of inquiry are sufficiently distinct such that work integrating the two is interdisciplinary; and b) the student's course work and independent study has provided the substantial depth of understanding normally expected at the Ph.D. level.

Breadth requirements vary by concentration area and are normally satisfied through a sequence of courses, independent study, and/or demonstration of proficiency through prior course work and/or experience. Breadth fulfillment is certified by a student's two lead faculty advisers and the IPER faculty director. See below for a list of courses that satisfy each of the breadth areas. Additional information about breadth requirements, including any updates to the list of courses that satisfy the requirements, can be found at http://iper/study/requirements.html or obtained from the IPER office.

The three core courses to be taken by all Ph.D. students are IPER 310, Environmental Forum Seminar (two quarters), IPER 320, Designing Environmental Research, and IPER 330, Research Approaches for Environmental Problem Solving. All core courses must earn a letter grade of 'B' or higher. Incoming students in the School of Earth Sciences are required to take IPER 300, Earth Sciences Seminar. IPER Ph.D. students are expected to take all courses, apart from undergraduate prerequisites, for a letter grade unless their advisers recommend otherwise.

2. To be admitted to candidacy for the Ph.D. degree, a student must have successfully completed at least 25 graded units (not including research credits) of graduate courses (200 level and above) maintaining a 'B' average. In addition, the student must pass an oral qualifying exam that demonstrates command of two areas of specialization as well as interdisciplinary breadth. The student may not have any incompletes on the transcript.
3. By the end of the sixth quarter of study, students present a Ph.D. candidacy plan to their primary advisers, with a copy to the associate and assistant directors. This plan should include:
   a) the names of 4-5 proposed oral qualifying exam committee members
   b) a list of courses or experiences used to fulfill the IPER breadth and depth requirements
   c) courses TA'd or which the student intends to TA to fulfill the teaching requirement
   d) an unofficial transcript to ensure completion of the IPER core curriculum
   e) a proposed date for the oral qualifying exam. The plan is reviewed and subject to approval by the IPER faculty director

   By the end of the sixth quarter of study, students organize the Meeting of the Minds as they develop their candidacy plan and dissertation proposal. For this meeting, the student should prepare a 10-15 minute oral presentation of the candidacy plan and thesis proposal. Additional courses or training opportunities the student may need to complete their dissertation research can also be identified.

   The oral qualifying exam should be completed by the end of the eighth quarter. By the end of the quarter prior to the quarter during which the oral qualifying exam is to be taken, a student must formally designate a committee, and the primary advisers must certify that the student is eligible to take the exam. The oral qualifying exam committee of 4-5 members should include the student's two lead faculty advisers and other faculty with expertise in at least two of the student's fields of inquiry; it may also include a member-at-large. The majority of the oral qualifying exam committee should be members of the Academic Council. The chair of the committee must be a member of the Academic Council and should not be one of the student's lead advisers. Normally, membership of the oral qualifying exam committee should not change after formal designation. Thereafter, the IPER Executive Committee must approve any proposed changes.

   The oral qualifying exam consists of two parts: a 20-40 minute presentation of a dissertation proposal and a question and answer period during which the student should be prepared to address questions about the dissertation proposal and broader questions arising from IPER breadth and depth course work. The total procedure should span two to two-and-a-half hours. A written dissertation proposal should be distributed to a student's oral qualifying exam committee 10 days before the actual examination. The proposal should be 15-30 pages in length, double-spaced, excluding appendices and references. It should include a title page, an abstract, an introduction outlining and motivating the research questions, a background literature review establishing the intellectual context of the proposed work, a description of the methodology or approaches to be taken in the work, a discussion of results and other progress made to date, a timeline for future research, and a references section. The proposal should discuss explicitly the interdisciplinary nature of the research and why it is appropriate for a degree in environment and resources.
4. Teaching experience is an essential element of training in the Ph.D. program. Each student is required to complete one quarter of teaching, which can be fulfilled by serving as a teaching assistant for IPER 320 or IPER 330 or by serving as a TA for any other course, in any department or program, with a discussion section or with an opportunity to lecture in at least two class sessions.
5. To complete the Ph.D., the student must pass a University oral examination in defense of the dissertation.
6. Degree progress is monitored through a formal annual review in which the student and advisers submit progress reports to the IPER Executive Committee; see http://pangea.stanford.edu/IPER/internal/about_annual_reviews.html.

Additional information may be found in the *Graduate Student Handbook* at http://www.stanford.edu/dept/DoR/GSH/.

The following courses may be taken to satisfy the breadth area requirements:

CULTURE AND INSTITUTIONS BREADTH COURSES

At least two courses are required; alternative courses may be proposed through IPER's exception process.

IPER 235. Global Environmental Ethics
IPER 265. Central America: Environment, Development and Security
ANTHSCI 153. The Population Question
ANTHSCI 162. Indigenous Peoples and Environmental Problems
ANTHSCI 164. Ecological Anthropology
ANTHSCI 252. Political Ecology
ECON 228. Institutions and Organizations in Historical Perspective
HISTORY 281A. Environmental History of the Americas
LAW 280. Toxic Harms
LAW 281. Natural Resources Law and Policy
LAW 437. Water Law and Policy
LAW 592. International Conflict
LAW 594. International Institutions
LAW 603. Environmental Law and Policy
LAW 604. Environmental Workshop
LAW 605. International Environmental Law and Policy
LAW 667. Marine Resources
POLISCI 351A. Foundations of Political Economy
POLISCI 362. New Economics of Organizations
POLISCI 424. Introduction to Political Psychology
POLISCI 435. Topics in the Philosophy of Social Science
POLISCI 436. Rational Choice
PUBLPOL 102. Organizations and Public Policy
PUBLPOL 166. Organizational Theory and Design
PUBLPOL 194. Technology Policy
SOC 116. Globalization and Organizations
SOC 260. Formal Organizations

SOC 264. Firms, Markets, and States
SOC 360. Foundations of Organizational Sociology
SOC 362. Organization and Environment
SOC 364. Organizations as Governance Structures
SOC 367. Institutional Analysis of Organizations
SOC 377. Comparing Institutional Forms: Public, Private, and Non-profit
STS 110. Ethics and Public Policy

ECONOMICS AND POLICY ANALYSIS BREADTH COURSES

Students taking IPER 243 are expected to have mastered the topics covered in any of the following course combinations or by equivalent courses previously taken elsewhere. Prior enrollment in one of these course combinations is encouraged.

ECON 50 and 51. Economic Analysis I and II
ECON 50. Economic Analysis I
and 155. Environmental Economics and Policy
ECON 150. Economic Policy Analysis
ECON 202N and 203N. Core Economics for Non-Economics Ph.D. Students
MS&E 241. Economic Analysis

Alternatively, students may satisfy the minimum breadth requirement by taking courses culminating in ECON 241 or 243.

ENGINEERING AND TECHNOLOGY BREADTH COURSES

At least two courses are required; alternative courses may be proposed through IPER's exception process.

CEE 101B. Mechanics of Fluids
CEE 166B. Floods and Droughts, Dams and Aqueducts
CEE 172. Air Quality Management
CEE 176A. Energy Efficient Buildings
CEE 176B. Electric Power: Renewables and Efficiency
CEE 177. Aquatic Chemistry and Biology
CEE 270. Movement and Fate of Organic Contaminants in Surface Waters and Groundwater
CEE 274E. Pathogens in the Environment
GES 230. Physical Hydrogeology
MS&E 250A. Engineering Risk Analysis

NATURAL SCIENCES BREADTH COURSES

At least two courses are required; alternative courses may be proposed through IPER's exception process.

IPER 250. Ecological Principles for Environmental Problem Solving
BIOSCI 101. Ecology
BIOSCI 121. Biogeography
BIOSCI 136. Evolutionary Paleobiology
BIOSCI 139. Biology of Birds
BIOSCI 143. Evolution
BIOSCI 144. Conservation Biology
BIOSCI 280. Fundamentals of Sustainable Agriculture
BIOHOPK 263H. Oceanic Biology
BIOHOPK 265H. Air and Water
BIOHOPK 266H. Molecular Ecology
BIOHOPK 272H. Marine Ecology
CEE 164. Introduction to Physical Oceanography
CEE 274A,B. Environmental Microbiology I, II
ENERGY 260. Groundwater Pollution and Oil Slicks
GEOPHYS 104. The Water Course
GEOPHYS 130. Biological Oceanography
GES 140. Remote Sensing of Land Use and Land Cover
GES 170. Environmental Geochemistry
GES 175. Science of Soils
GES 205. Advanced Oceanography
GES 230. Physical Hydrogeology
GES 240. Geostatistics for Spatial Phenomena
GES 259. Marine Chemistry
GES 268. Geomicrobiology

COURSES

Additional courses may be listed in the quarterly *Time Schedule*.

IPER 200. Going Green: Research, Writing, and Reporting to the Public—Preference to graduate students. Focus is on environmental, economic, and cultural consequences of day-to-day behavioral choices such as computers on at all times versus only when used, or biodegradable versus metal forks at cafés. Sources include scientific and technical literature from disciplines such as energy, biology, and economics. How to write summaries that integrate relevant information for a lay audience. Prerequisite: consent of instructor.

3-4 units, Aut (Root, T; Moekle, K)

IPER 210. Communication and Leadership Skills—(Same as BIOSCI 388.) Focus is on delivering information to policy makers and the lay public. How to speak to the media, Congress, and the general public; how to write op-eds and articles; how to package ideas including titles, abstracts, and CVs; how to survive peer review, the promotion process, and give a job talk; and how to be a responsible science advocate.

2 units, Spr (Root, T)

IPER 220A,B,C. Special Topics Seminar—For IPER Ph.D. students; other graduate students with consent of instructor. Challenges of interdisciplinary research; collaborations across disciplines. Topical or methodological focus depending on faculty and student interests. May be repeated for credit.

1-5 units, Aut, Win, Spr, Sum (Staff)

IPER 235. Global Environmental Ethics—Theories of environmental ethics and their evolution. Environmental treaties as a framework to analyze case studies of contemporary ethical issues raised by environmental problems that transcend national boundaries.

4-5 units, not given this year

IPER 243. Energy and Environmental Policy Analysis—(Same as MS&E 243.) Concepts, methods, and applications. Energy/environmental policy issues such as automobile fuel economy regulation, global climate change, research and development policy, and environmental benefit assessment. Group project. Prerequisite: 241 or ECON 50, 51.

3 units, Spr (Sweeney, J)

IPER 270. Graduate Practicum in Environment and Resources—Opportunity for IPER students to pursue areas of specialization in an institutional setting such as a laboratory, clinic, research institute, governmental agency, non-governmental organization, or multilateral organization. Meets US CIS requirements for off-campus employment with endorsement from designated school official.

1-9 units, Aut, Win, Spr, Sum (Daily, G)

IPER 286. Interpersonal Influence and Leadership—(Same as MS&E 286, GSBGEN 374, LAW 628.) How one's actions affect and influence others and the ability to work with them. Foundational skills such as the ability to work through difficult issues, give and receive feedback, and work in groups. How to work with different people. The art of learning from experience. Prerequisiste: consent of instructor.

3-4 units, Win (Robin, C)

IPER 300. Earth Sciences Seminar—(Same as EARTHSYS 300, EEES 300, GES 300, GEOPHYS 300, ENERGY 300.) Required for incoming graduate students except coterms. Research questions, tools, and approaches of faculty members from all departments in the School of Earth Sciences. Goals are: to inform new graduate students about the school's range of scientific interests and expertise; and introduce them to each other across departments and research groups. Two faculty members present work at each meeting. May be repeated for credit.

1 unit, Aut (Matson, P; Graham, S)

IPER 310. Environmental Forum Seminar—Required IPER core course for first year Ph.D. and joint and dual M.S. students. Conceptual framework, analytical approaches, validity of conclusions from an interdisciplinary perspective, and alternative approaches. Autumn Quarter: participants attend the Woods Institute's Environmental Forum series

or other seminar on campus selected by faculty and students. Winter Quarter: guest Stanford faculty discuss environment and sustainability research. May be repeated for credit. Prerequisite for non-IPER graduate students: application.

1-2 units, Aut (Schneider, S; Root, T), Win (Staff)

IPER 320. Designing Environmental Research—Required IPER core course restricted to first year IPER Ph.D. students. Alternative designs for environmental research projects. Primary data collection techniques versus mixed method approaches. Interpretation of data, including basic statistical methods. Analysis of environmental literature, and development of individual research design, data collection, and analysis strategies.

3 units, Win (Davis, J)

IPER 330. Research Approaches for Environmental Problem Solving—Required IPER core course restricted to first year IPER Ph.D. students. How to identify good research questions and implement interdisciplinary research in environment and resources. Student presentations of work in progress; peer critique of written work. Guest speakers including from the Center for Teaching and Learning. Corequisite: 398 with the faculty member chosen to explore a possible dissertation topic.

3 units, Spr (Ortolano, L)

IPER 333. Water Policy Colloquium—(Same as CEE 333, GES 333.) Student-organized interdisciplinary colloquium. Creation, implementation, and analysis of policy affecting the use and management of water resources. Weekly speakers from academia and local, state, national, and international agencies and organizations.

1 unit, Spr (Freyberg, D)

IPER 335. Environmental Science for Managers and Policy Makers—(Same as LAW 608, OIT 338.) Core course for joint J.D., M.B.A., or M.D. with M.S. in Environment and Resources; open to first-year Law and GSB students; recommended for those who plan to apply to the joint degree program. Fundamentals of earth and environmental science, spreadsheet modeling, optimization, and Monte Carlo simulation. Applications in resource management and environmental policy.

4 units, Win (Plambeck, E; Caldwell, M; Palumbi, S; Daily, G; Kennedy, D; Field, C; Masters, G)

IPER 339. Environmental Entrepreneurship—(Same as GSBGEN 339.) Preference to graduate students; advanced undergraduates require consent of instructor. Environmental challenges as entrepreneurial opportunities. Application of business principles of finance, marketing, operations, and economics to provision of environmental goods and services. Innovation in conservation, energy, and materials. Guest speakers include environmental entrepreneurs, venture capitalists, corporate executives, and nonprofit leaders. Students develop business plans.

4 units, Aut (Plambeck, E)

IPER 398. Directed Individual Study in Environment and Resources—Under supervision of an IPER faculty member on a subject of mutual interest.

1-9 units, Aut, Win, Spr, Sum (Staff)

IPER 399. Directed Research in Environment and Resources—For advanced graduate students.

1-9 units, Aut, Win, Spr, Sum (Staff)

IPER 410. Ph.D. Qualifying Tutorial—For Ph.D. students only.

1 unit, Aut, Win, Spr, Sum (Staff)

IPER 460. Proposal Writing Tutorial—Practical training in grant writing methods. Students draft research proposals relevant to individual interests with supervision from IPER faculty.

1-2 units, Aut, Win, Spr (Staff)

IPER 480. Dissertation Writing Tutorial in Environment and Resources—For students who have completed the oral qualifying examination.

1-15 units, Aut, Win, Spr, Sum (Staff)

COGNATE COURSES

See respective department listings for course descriptions. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

ANTHSCI 162/262. Indigenous Peoples and Environmental Problems

3-5 units, not given this year

BIOHOPK 163H. Oceanic Biology

4 units, not given this year

BIOSCI 101. Ecology

3 units, Aut (Vitousek, P; Dirzo, R)

BIOSCI 139. Biology of Birds

3 units, Spr (Root, T)

BIOSCI 143/243. Evolution

3 units, Aut (Watt, W)

CEE 101B. Mechanics of Fluids

4 units, Spr (Koseff, J)

CEE 164 262D. Introduction to Physical Oceanography—(Same as EARTHSYS 164.)

4 units, Spr (Hench, J)

CEE 166B/ 266B. Floods and Droughts, Dams, and Aqueducts

3 units, Win (Freyberg, D)

CEE 172. Air Quality Management

3 units, Win (Hildemann, L), Sum (Kopperud, R)

CEE 176A. Energy Efficient Buildings

3-4 units, Win (Masters, G)

CEE 176B. Electric Power: Renewables and Efficiency

3-4 units, Spr (Masters, G)

CEE 177. Aquatic Chemistry and Biology

4 units, Aut (Yeung, C)

CEE 270. Movement and Fate of Organic Contaminants in Waters

3 units, Aut (Luthy, R), Sum (Robertson, A)

CEE 274A. Environmental Microbiology I—(Same as CHEMENG 174/274.)

3 units, Aut (Spormann, A), Sum (Sepulveda-Torres, L)

CEE 274B. Metabolic Biochemistry of Microorganisms—(Same as CHEMENG 456.)

3 units, Win (Spormann, A), alternate years, not given next year

EARTHSYS 180/280. Fundamentals of Sustainable Agriculture—(Same as BIOSCI 180/280.)

3 units, alternate years, not given this year

ECON 50. Economic Analysis I

5 units, Aut (Abramitzky, R), Spr (Tendall, M), Sum (Aturupane, C)

ECON 51. Economic Analysis II

5 units, Aut (Tendall, M), Win (Einav, L), Sum (Nicholson, S)

ECON 155. Environmental Economics and Policy—(Same as EARTHSYS 112.)

5 units, Aut (Staff)

ECON 228. Institutions and Organizations in Historical Perspective

2-5 units, Aut (Greif, A)

ECON 243. Economics of Environment

2-5 units, Spr (Staff), not given next year

ENERGY 240. Geostatistics for Spatial Phenomena—(Same as GES 240.)

3-4 units, Win (Journel, A)

GES 170. Environmental Geochemistry
4 units, Win (Brown, G)

GES 175. Science of Soils
4 units, Spr (Fendorf, S)

GES 230. Physical Hydrogeology—(Same as CEE 260A.)
4 units, Aut (Gorelick, S)

HUMBIO 112. Conservation Biology—(Same as BIOSCI 144.)
3-4 units, Win (Boggs, C; Launer, A)

HUMBIO 118. Ecological Anthropology—(Same as ANTHSCI 164/264.)
3-5 units, not given this year

MS&E 241. Economic Analysis
3-4 units, Win (Weber, T)

MS&E 250A. Engineering Risk Analysis
2-3 units, Win (Paté-Cornell, E)

POLISCI 351A. Foundations of Political Economy—(Same as POL-ECON 680.)
4 units, Aut (Hatfield, J)

POLISCI 362. New Economics of Organization
5 units, Spr (Weingast, B)

PUBLPOL 102. Organizations and Public Policy
5 units, Aut (Hannan, M)

PUBLPOL 104. Economic Policy Analysis—(Same as ECON 150.)
5 units, Spr (Staff)

PUBLPOL 194. Technology Policy
5 units, Win (Windham, P)

SOC 160/260. Formal Organizations
5 units, Win (Zhou, X)

SOC 262/362. Organization and Environment—(Same as OB 672.)
4 units, Aut (Carroll, G)

SOC 367. Institutional Analysis of Organizations
3-5 units, Aut (Scott, W)

STS 110. Ethics and Public Policy—(Same as MS&E 197, PUBLPOL 103B.)
5 units, Win (McGinn, R)