

INTERDISCIPLINARY GRADUATE PROGRAM IN ENVIRONMENT AND RESOURCES (IPER)

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Courses offered by the Interdisciplinary Graduate Program in Environment and Resources have the subject code IPER, and are listed in the "Interdisciplinary Graduate Program in Environment and Resources (IPER) Courses" section of this bulletin.

The Interdisciplinary Graduate Program in Environment and Resources (IPER) is designed to create interdisciplinary scholars and leaders to address the world's most challenging environmental and sustainability challenges. IPER students combine academic disciplines, including natural and earth sciences, engineering, economics, humanities, social sciences, law, health, policy, and business, to yield new insights and novel solutions to urgent global problems, such as energy use, climate change, food security, freshwater availability, depletion of ocean resources, land degradation, and biodiversity loss.

IPER offers a Ph.D. and, for students currently enrolled in Stanford's Graduate School of Business, Stanford Law School, and School of Medicine, a joint degree consisting of an M.S. in Environment and Resources in combination with their professional degree. Both degrees are interdisciplinary, giving students exposure to environmental and sustainability issues and insight into new knowledge, technologies, and policies to help solve these problems. IPER students select classes offered in all seven schools of the University.

IPER faculty and student research and policy efforts address issues such as the science and policy of global climate change, regional security, the mapping and valuation of ecosystem services, energy development, agricultural intensification and variability, characterization and effects of land use change, and conservation finance. Research examples include: an analysis of the economics and eco-hydrological dynamics of water supplies in rapidly growing cities; an investigation of the impact of marine protected areas on the health of fisheries and on the economics of the fishing industry; and a study of the potential role of local transportation policies and incentives in reducing global greenhouse gas emissions. For additional information about IPER student research and other academic and professional activities, see <http://iper.stanford.edu/research>.

IPER's affiliated faculty members come from all seven Stanford schools and represent a diversity of environment and sustainability interests and research and policy approaches. More information about individual faculty can be found on the IPER web site (<http://iper.stanford.edu/faculty>); more details on Stanford's interdisciplinary environmental research and policy work generally can be found on the Woods Institute for the Environment's web site, <http://woods.stanford.edu>.

GRADUATE PROGRAMS IN ENVIRONMENT AND RESOURCES

The University's basic requirements for the M.S. and Ph.D. degrees are discussed in the "Graduate Degrees" section of this bulletin. The IPER Ph.D. and M.S. degrees are guided by comprehensive requirements created with faculty and student input and approved by IPER's executive committee. For more detail about the current Ph.D. and M.S. degree requirements, see <http://iper.stanford.edu>.

MASTER OF SCIENCE IN ENVIRONMENT AND RESOURCES

Students may not apply directly for the M.S. in Environment and Resources degree. The M.S. is an option exclusively for students currently enrolled in the joint degree programs with the M.B.A. in the Graduate School of Business or the J.D. with the Stanford Law School; concurrently pursuing the M.D. in the School of Medicine; or for IPER Ph.D. students who do not continue the Ph.D.

JOINT MASTER'S DEGREE

Students enrolled in a professional degree program in Stanford's Graduate School of Business or the Stanford Law School are eligible

to apply for admission to the joint M.S. in Environment and Resources joint degree program (JDP). Enrollment in the JDP allows students to pursue an M.S. degree concurrently with their professional degree and to count a defined number of units toward both degrees, resulting in the award of joint M.B.A. & M.S. in Environment and Resources degrees or joint J.D. & M.S. in Environment and Resources degrees. The joint M.B.A./M.S. degree program requires a total of 129 quarter units to be completed over approximately eight academic quarters (compared to 100 units for the M.B.A. and 45 units for the M.S. if pursued as separate degrees). The joint J.D./M.S. degree program requires a total of 87 semester or 130.5 quarter units (compared to 86 semester units for the J.D. and 45 quarter units for the M.S. if pursued separately) and may be completed in three years. For additional information, see <http://iper.stanford.edu/study/requirements.html#ms>.

Students in the JDP are required to take two core courses: IPER 310, Environmental Forum Seminar, and IPER 335, Environmental Science for Managers and Policy Makers (same as OIT 338 and LAW 608). 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 or higher, while maintaining a 'B' average. A maximum of 4 units of directed research and independent study may be counted toward the M.S. Joint J.D./M.S. students are also required to take LAW 604, Environmental Law Workshop, and, as part of this class or an alternate one, to write a 25-35 page paper on a topic of their choosing that integrates their J.D. and M.S. course work. It is recommended that joint M.B.A./M.S. students take GSBGEN 339, Environmental Entrepreneurship.

Additional M.S. courses may be chosen from approved course lists in IPER's four focal areas (culture and institutions; economics and policy analysis; engineering and technology; or natural sciences) or from other courses at the appropriate level approved by the student's advising team. These courses are listed in the "Doctor of Philosophy in Environment and Resources" section of this bulletin. A maximum of 12 units (8 semester units) from the student's professional school, including Environmental Law Workshop units for Joint J.D./M.S. students, may be applied toward the M.S. A list of approved GSB and School of Law courses can be found in the M.S. requirements: <http://pangea.stanford.edu/IPER/internal>. In the approved GSB classes, joint M.B.A./M.S. students must focus their final projects on an environmental or natural resource topic for that course to be counted toward the M.S. While a science or mathematics background is not required for acceptance, quantitative skills are necessary for many courses and 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 two degrees are 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 MASTER'S DEGREE

Only students in the School of Medicine may apply to pursue the M.S. in Environment and Resources degree by meeting the University's minimum requirements for the M.D. and complete an additional 45 units for the M.S. in Environment and Resources. Completion of the M.S. is anticipated to require at least three quarters in addition to the quarters required for the M.D.

Students in this 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 or higher, while maintaining a 'B' average. A maximum of 8 units of directed research and independent study may be counted toward the dual M.S./M.D. degree program. Additional M.S. courses may be chosen from approved course lists in IPER's four focal areas (culture and institutions; economics and policy analysis; engineering and technology; or natural sciences) or from other courses approved by the student's advising team. While a science or mathematics background is not required for acceptance, quantitative skills are necessary for many courses and 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 an IPER faculty member. The degrees are conferred 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 or who do not advance to candidacy for the Ph.D. Admission directly to the M.S. program is not allowed.

M.S. course work totals at least 45 units at or above the 100-level, of which the majority of units should be at or above the 200-level. Masters students normally complete the IPER Ph.D. core curriculum, comprising: IPER 310, Environmental Forum Seminar; IPER 320, Designing Environmental Research; and IPER 330, Research Approaches for Environmental Problem Solving. Additional courses may be selected from approved course lists in IPER's four focal areas (culture and institutions; economics and policy analysis; engineering and technology; or natural sciences) or from other courses approved by the student's lead advisers. Students may take no more than 6 of the required 45 units credit/no credit and must maintain at least a 'B' average in all courses taken for the M.S. degree. Directed research and independent study may count for a maximum of 8 units of the 45 unit M.S.

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 IN ENVIRONMENT AND RESOURCES

IPER's Ph.D. requirements, updated annually at <http://iper.stanford.edu/study/requirements.html#phd>, lay out a scaffold of advising meetings, core courses, program activities, and milestones to guide students' progress. Each student works with a faculty advising team, comprising at least two faculty from different disciplines, 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.

Program specific Ph.D. requirements are outlined in detail in the current year requirements and are summarized below:

Completion of the Ph.D. core course sequence: IPER 310, Environmental Forum Seminar (two quarters); IPER 320, Designing Environmental Research; and IPER 330, Research Approaches for Environmental Problem Solving, each with a letter grade of 'B' or higher. IPER Ph.D. students are also required to take IPER 300, Earth Sciences Seminar, which is required of all incoming School of Earth Sciences graduate students.

1. Completion of the breadth requirement in all four focal areas (culture and institutions; economics and policy analysis; engineering and technology; and natural sciences) through a sequence of courses, independent study, and/or demonstration of proficiency through prior course work or experience. Specific requirements and approved courses that satisfy breadth in each of the four focal areas are listed below; updates can be found at <http://iper/study/requirements.html>. Fulfillment of the breadth requirement must be certified by the student's two lead faculty advisers and the IPER faculty director.
2. Fulfillment of depth in the student's chosen fields of inquiry through additional courses, research, and/or independent studies. The student's two lead faculty advisers 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.

3. Completion of quarterly meetings with advisers during the first year, culminating in the Spring Quarter first-year big picture advising meeting; and at minimum, annual meetings thereafter, including the Spring Quarter Second Year Meeting of the Minds, prior to which students must formally identify their two lead advisers and two distinct fields of inquiry.
4. Submission of a candidacy plan by end of Spring Quarter of the second year, for review at the Second Year Meeting of the Minds and approval by IPER's faculty director. The candidacy plan should document how the student has fulfilled the program requirements to date and include a summary of research ideas and a list of faculty who might serve as qualifying exam committee members.
5. Successful completion of the oral qualifying exam and completion of the requirements for candidacy, including at least 25 graded graduate course units (200 level and above) with at least a 'B' average, by the end of Winter Quarter of the third year. The oral qualifying exam committee should include the student's two lead advisers and 2-3 other faculty with expertise in the student's research area. The majority of the oral qualifying exam committee should be members of the Academic Council; the chair of the committee must be an Academic Council member and may not be one of the student's two lead advisers. In exceptional cases, the committee may include a member-at-large who is not a Stanford faculty member as a fourth or fifth member.
6. Completion of a written dissertation, approved by the student's dissertation reading committee consisting of the student's lead advisers and at least one other member, and passage of the University oral examination in defense of the dissertation following the guidelines outlined in the "Graduate Degrees" section of this bulletin. The University oral examination committee comprises the student's two lead advisers, at least two additional members, and a chair who is outside of the departments of the lead advisers, all of whom are normally Academic Council members. Appointment of a non-Academic Council member must be justified and approved by the faculty director.

In addition to the requirements listed above, Ph.D. students must:

1. Serve as a teaching assistant for at least one quarter in a course with a discussion section or with an opportunity to lecture in at least two class sessions, in any department or program, including IPER 320 or IPER 330. Students should fulfill the teaching requirement by the end of the third year unless they obtain a firm commitment from a faculty member to TA a future course.
2. Submit at least one grant proposal for external funding, defined as fellowship and/or research funds provided by a government agency, a private foundation, or a University entity other than IPER or the School of Earth Sciences. Participate each year in a Spring Quarter annual review in which the student and lead advisers submit progress reports to the IPER executive committee.

The following courses may be taken to satisfy the breadth requirement in IPER's four focal areas. Students should consult the current year's bulletin and time schedule to determine which courses are available this year.

CULTURE AND INSTITUTIONS BREADTH COURSES

At least two courses are required. Students may choose a course not listed below provided it meets the criteria for this breadth area's subject knowledge. Students are advised to seek approval from their lead advisers in advance and are required to obtain their advisers' signatures on the breadth certification form as verification that they have met this requirement.

ANTHRO 247. Nature, Culture, Heritage
 ANTHRO 262. Indigenous Peoples and Environmental Problems
 EARTHSYS 224. Environmental Justice: Local, National, and International Dimensions
 ECON 228. Institutions and Organizations in Historical Perspective
 HISTORY 281A. Environmental History of the Americas

HISTORY 276. Modern Brazil
 LAW 280. Toxic Harms
 LAW 281. Natural Resources Law and Policy
 LAW 437. Water Law and Policy
 LAW 455. Energy Law and Policy
 LAW 603. Environmental Law and Policy
 LAW 604. Environmental Law Workshop
 LAW 605. International Environmental Law and Policy
 LAW 667. Marine Resources
 MS&E 252. Decision Analysis I
 POLISCI 351A. Foundations of Political Economy
 POLISCI 362. New Economics of Organizations
 POLISCI 364. Theories of Political Institutions
 POLISCI 424. Introduction to Political Psychology
 POLISCI 435. Topics in the Philosophy of Social Science
 POLISCI 436. Rational Choice
 POLISCI 440A. Theories in Comparative Politics
 POLISCI 440B. Comparative Political Economy
 POLISCI 440C. Methods in Comparative Politics
 POLISCI 442. Qualitative and Field Methods
 PSYCH 223. Social Norms
 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 314. Economic Sociology
 SOC 318. Social Movement and Collective Action
 SOC 320. Foundations of Social Psychology
 SOC 360. Foundations of Organizational Sociology
 SOC 362. Organization and Environment
 SOC 363. Social and Political Processes in Organizations
 SOC 363A. Seminar on Organizational Theory
 SOC 364. Organizations as Governance Structures
 SOC 367. Institutional Analysis of Organizations
 SOC 377. Comparing Institutional Forms: Public, Private, and Nonprofit

ECONOMICS AND POLICY ANALYSIS BREADTH COURSES

One of the alternative course sequences listed below, culminating in IPER 243 (same as MS&E 243), satisfies the minimum breadth requirement:

ECON 50 and 51. Economic Analysis I and II
 ECON 50. Economic Analysis I and ECON 155. Environmental Economics and Policy
 ECON 202 or ECON 202N and ECON 203 or ECON 203N. Core Economics
 ECON 206. World Food Economy
 MS&E 241. Economic Analysis
 MS&E 248. Economics of Natural Resources
 PUBLPOL 201A. Microeconomics
 Possible substitutes for IPER 243:
 ECON 250. Environmental Economics
 ECON 251. Natural Resources and Energy
 PUBLPOL 201B. Cost-Benefit Analysis and Evaluation

The same alternative prerequisites listed above apply to PUBLPOL 201B, ECON 250, and ECON 251. PUBLPOL 201B focuses less on environmental issues than IPER 243. Ph.D. students choosing economics and policy analysis as one of their fields of inquiry are encouraged to take ECON 202 or ECON 202N and ECON 203 or ECON 203N, in addition to IPER 243, ECON 250, and/or ECON 251.

ENGINEERING AND TECHNOLOGY BREADTH COURSES

At least one course is required; this list represents examples of appropriate courses only. Students may choose a course not listed below provided it meets the criteria for this breadth area's subject knowledge. Students are advised to seek approval from their lead advisers in advance and are required to obtain their advisers' signatures on the breadth certification form as verification that they have met this requirement.

CEE 101B. Mechanics of Fluids
 CEE 215. Goals and Methods of Sustainable Building Projects

CEE 161A. Rivers, Streams, and Canals
 CEE 166B. Floods and Droughts, Dams and Aqueducts
 CEE 172. Air Quality Management
 CEE 207A. Energy Resources
 CEE 176A. Energy Efficient Buildings
 CEE 176B. Electric Power: Renewables and Efficiency
 CEE 177. Aquatic Chemistry and Biology
 CEE 201D. Computations in Civil and Environmental Engineering
 CEE 260A. Physical Hydrogeology
 CEE 262B. Transport and Mixing in Surface Water Flows
 CEE 263A. Air Pollution Modeling
 CEE 270. Movement and Fate of Organic Contaminants in Surface Waters and Groundwater
 CEE 274E. Pathogens in the Environment
 EE 293A. Fundamentals of Energy Processes
 EE 293B. Fundamentals of Energy Processes
 ENERGY 101. Energy and the Environment
 ENERGY 102. Renewable Energy Sources and Greener Energy Processes
 ENERGY 104. Technology in the Greenhouse
 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
 BIO 101. Ecology
 BIO 102. Demography: Health, Development, Environment
 BIO 106. Human Origins
 BIO 117. Biology and Global Change
 BIO 121. Biogeography
 BIO 136. Evolutionary Paleobiology
 BIO 139. Biology of Birds
 BIO 143. Evolution
 BIO 144. Conservation Biology
 BIO 175. Tropical Ecology and Conservation
 BIO 247. Controlling Climate Change in the 21st Century
 BIO 264. Biosphere-Atmosphere Interactions
 BIO 216. Terrestrial Biogeochemistry
 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
 EARTHSYS. 208. Coastal Wetlands
 EESS 141. Remote Sensing of the Oceans
 EESS 143/231. Marine Biogeochemistry
 EESS 155. Science of Soils
 EESS 266. Soil Chemistry
 EESS 162. Remote Sensing of Land Use and Land Cover
 EESS 164. Fundamentals of Geographic Information Science (GIS)
 EESS 220. Physical Hydrogeology
 EESS 240. Advanced Oceanography
 EESS 258. Geomicrobiology
 EESS 259. Environmental Microbial Genomics
 ENERGY 260. Groundwater Pollution and Oil Slicks
 GEOPHYS 104. The Water Course
 GEOPHYS 130. Biological Oceanography
 GES 170. Environmental Geochemistry
 GES 259. Marine Chemistry

INTERDISCIPLINARY PROGRAM IN ENVIRONMENT AND RESOURCES (IPER) COURSES

For information on graduate programs in the Interdisciplinary Program in Environment and Resources, including lists of courses which fulfill breadth requirements, see the "Interdisciplinary Graduate Program in Environment and Resources" section of this bulletin.

GRADUATE COURSES IN INTERDISCIPLINARY PROGRAM IN ENVIRONMENT AND RESOURCES

Primarily for graduate students; undergraduates may enroll with consent of instructor.

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 units, Aut (Staff), Spr (Staff)

IPER 210. Communication and Leadership Skills

(Same as BIO 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 220. Special Topics Seminar

For IPER Ph.D. and joint degree M.S. 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 unit, Aut (Staff), Win (Staff), Spr (Staff), Sum (Staff)

IPER 220A. Special Topics Seminar

For IPER Ph.D. and joint degree M.S. 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 unit, Aut (Staff), Win (Staff), Spr (Staff), Sum (Staff)

IPER 220B. Special Topics Seminar

For IPER Ph.D. and joint degree M.S. 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 unit, Aut (Staff), Win (Staff), Spr (Staff)

IPER 220C. Special Topics Seminar

For IPER Ph.D. and joint degree M.S. 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 unit, Aut (Staff), Win (Staff), Spr (Staff)

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 250. Ecological Principles for Environmental Problem Solving

For joint degree M.S. students in Law, Business, or Medicine, or IPER Ph.D. or other graduate students with limited biology background. Topics include field methods, climate, biogeography, biogeochemical cycles, physiology, population genetics, and environmental ethics.

3 units, Spr (Staff)

IPER 260. The Social Sciences and Environmental Problem Solving

For students with little background in the social sciences interested in incorporating them into their research. Focus is on the contribution that the social sciences of international relations, political science, anthropology, and sociology make to environmental problem solving. Case studies from international regime building, inter-agency politics, organizational behavior, and cultural dynamics.

2-3 units, not given this year

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 (Daily, G), Win (Daily, G), Spr (Daily, G), Sum (Daily, G)

IPER 300. Earth Sciences Seminar

(Crosslisted in each department in the School of Earth Sciences.) Required for incoming graduate students except cotermers. 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 (Harris, J)

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 (Oleson, K)

IPER 320. Designing Environmental Research

Required IPER core course restricted to first year IPER Ph.D. students. Research design options for environmentally related research. Major philosophies of knowledge and how they relate to research objectives and design choices. Evaluation of strengths and weaknesses of alternative research designs, emphasizing methods, data, and argument. Development of individual research design proposals, including description and justification understandable to a non-specialist.

4 units, Win (Davis, J; Scruggs, C)

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. Corequisite: 398 with the faculty member chosen to explore a possible dissertation topic.

3 units, Spr (Ortolano, L; Schaffer, H)

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; Daily, G; Field, C; Masters, G; Palumbi, S)

IPER 339. Environmental Entrepreneurship

(Same as GSBGEN 339.) The potential of markets for solving environmental problems, and for environmental entrepreneurs to invent those solutions. How to apply business principles of finance, marketing, economics, operations, and accounting to the provision of environmental goods and services. Case studies include innovation in materials and energy, conservation of land and wildlife, environmental product differentiation and supply chain management, investing under regulatory risk, and partnership between nonprofit and for-profit organizations. Guest speakers include environmental entrepreneurs, venture capitalists, corporate executives, and nonprofit leaders. Students develop their own business plans in environmental entrepreneurship.

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 (Staff), Win (Staff), Spr (Staff), Sum (Staff)

IPER 399. Directed Research in Environment and Resources

For advanced graduate students.

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

IPER 410. Ph.D. Qualifying Tutorial

For Ph.D. students only.

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

IPER 480. Dissertation Writing Tutorial in Environment and Resources

For students who have completed the oral qualifying examination.

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