EMMETT INTERDISCIPLINARY PROGRAM IN ENVIRONMENT AND RESOURCES (E-IPER)

Courses offered by the Emmett Interdisciplinary Program in Environment and Resources are listed under the subject code ENVRES on the Stanford Bulletin's ExploreCourses web site (http://explorecourses.stanford.edu/search;jsessionid=75B13D9BD401BF4435773811DC678716?view=catalog&catalog=&page=0&q=ENVRES&filter-catalognumber-ENVRES=on&filter-coursestatus-Active=on).

Mission of the Program

The Emmett Interdisciplinary Program in Environment and Resources develops the knowledge, skills, perspectives, and ways of thinking needed to understand and help solve the world's most significant environmental and resources sustainability challenges. E-IPER strives to be a model for interdisciplinary graduate education. E-IPER offers a Ph.D. in Environment and Resources, a Joint M.S. exclusively for students in Stanford's Graduate School of Business or Stanford Law School, and a Dual M.S. for students in the School of Medicine or a Ph.D. program in another department. E-IPER's home is the School of Earth, Energy & Environmental Sciences; affiliated faculty come from all seven Stanford schools.

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 (http://exploredegrees.stanford.edu/graduatedegrees)" section of this bulletin. The E-IPER Ph.D. and M.S. degrees are guided by comprehensive requirements created with faculty and student input and approved by E-IPER's Executive Committee. To access the current Ph.D. and M.S. degree requirement documents, see the E-IPER web site.

Learning Outcomes (Graduate)

Completion of the Ph.D. and M.S. degrees in Environment and Resources provides students with the knowledge, skills, perspectives, and ways of thinking needed to understand and help solve the world's most significant environmental and resources sustainability challenges.

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 M.B.A. students in the Graduate School of Business, J.D. students in the Stanford Law School, M.D. students in the School of Medicine, students pursuing a Ph.D. in another Stanford department, and for E-IPER Ph.D. students who do not continue in the Ph.D. degree program.

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 Degree Program (JDP). Enrollment in the Joint M.S. Program 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. and M.S. in Environment and Resources degree or a joint J.D. and M.S. in Environment and Resources degree.

The Joint M.B.A./M.S. degree program requires a total of 129 units (84 units for the M.B.A. and 45 units for the M.S., compared to 105 units for the M.B.A. and 45 units for the M.S. if pursued as separate degrees) to be completed over approximately eight academic quarters.

The Joint J.D./M.S. degree program requires a minimum of 113 units. The J.D. degree requires 111 units (minimum of 80 Law units and 31 non-Law units) and the M.S. degree requires 45 units. The joint degree allows up to 43 overlapping units, inclusive of the 31 non-Law units allowed within the J.D. degree and 12 professional school units allowed within the M.S. degree. Students may need to take additional units beyond the minimum 113 to satisfy the degree requirements for both the J.D. and M.S. The joint J.D./M.S. may be completed in three years.

The student's program of study is subject to the approval of the student's faculty adviser and E-IPER staff. The joint degrees are conferred when the requirements for both the E-IPER M.S. and the professional degree programs have been met.

In addition to requirements for the professional degree, all joint M.S. students are required to complete 45 units within the parameters outlined below and must achieve a 'B' (3.0) grade point average in all letter-graded courses taken toward the M.S. degree.

1. Completion of a required introductory core course and a capstone project seminar:

		Units
ENVRES 280	Introduction to Environmental Science	2
ENVRES 290	Capstone Project Seminar in Environment and Resources *	1-3

* The capstone project integrates the student's professional and M.S. degrees and must be taken for a minimum of 3 units over one or two quarters.

2. Completion of a minimum of four letter-graded courses from one Joint M.S. Course Track (specific track course listings below):
   a. Cleantech
   b. Climate and Atmosphere
   c. Energy
   d. Freshwater
   e. Global, Community, and Environmental Health
   f. Land Use and Agriculture
   g. Oceans and Estuaries
   h. Sustainable Built Environment
   i. Sustainable Design
3. Completion of at least four additional 3-5 unit letter-graded elective courses at the 100-level or higher. Courses may be taken from the student's selected course track, another course track, or elsewhere in the University, provided they are relevant to the student's environment and resources course of study.

Among the courses fulfilling the M.S. requirements, the student must complete at least 23 units at the 200-level or above. Courses numbered under 100 are not allowable.

Additional restrictions on course work that may fulfill the Joint M.S. degree include:

- A maximum of 5 units from courses that are identified as primarily consisting of guest lectures, such as the Energy Seminar or the Environmental Law Workshop, may be counted toward the joint M.S. degree.

- A maximum of 5 units of individual study courses, directed reading and independent research units (such as ENVRES 398 Directed Reading in Environment and Resources or ENVRES 399 Directed Research in Environment and Resources). One individual study course, if taken for 3-5 letter-graded units, can be counted as one of the four elective courses.
- A maximum of 12 units from approved courses related to the environmental and resource fields from any professional school. One approved professional school course can be counted as one of the four electives.

Dual Master's Degree

Students in the School of Medicine or students pursuing a Ph.D. in another Stanford department may apply to pursue the M.S. in Environment and Resources dual degree. For the dual degree, students must meet the University's minimum requirements for their M.D. or Ph.D. degree and also 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 student's other degree. For additional information, see the E-IPER website.

The student's program of study is subject to the approval of the student's faculty adviser and E-IPER staff. The two degrees are conferred when the requirements for both the E-IPER M.S. and the other degree program have been met. For application information, see the Admissions (https://pangea.stanford.edu/programs/eiper/admissions) page on the E-IPER website.

In addition to requirements for the M.D. or Ph.D. degree, students are required to complete 45 units within the parameters outlined below and must achieve a 'B' (3.0) grade point average in all letter-graded courses taken toward the M.S. degree.

1. Completion of a required introductory core course and a capstone project seminar:

		Units
ENVRES 280	Introduction to Environmental Science	2
ENVRES 290	Capstone Project Seminar in Environment and Resources *	1-3

   * The Capstone Project integrates the student's professional/Ph.D. and M.S. degrees and must be taken for a minimum of 3 units over one or two quarters.

2. Completion of a minimum of four letter-graded courses from one M.S. Course Track (specific track course listings below):
   - Cleantech
   - Climate and Atmosphere
   - Energy
   - Freshwater
   - Global, Community, and Environmental Health
   - Land Use and Agriculture
   - Oceans and Estuaries
   - Sustainable Built Environment
   - Sustainable Design
3. Completion of at least four additional 3-5 unit letter-graded elective courses at the 100-level or higher. Courses may be taken from the student's selected course track, another course track, or elsewhere in the University, provided they are relevant to the student's environment and resources course of study.

Among the courses fulfilling the M.S. requirements, completion of at least 23 units at the 200-level or above. Courses numbered under 100 are not allowable.

Additional restrictions on course work that may fulfill the dual M.S. degree include:

- A maximum of 5 units from courses that are identified as primarily consisting of guest lectures, such as the Energy Seminar or the Environmental Law Workshop may be counted toward the dual M.S. degree.
- A maximum of 5 units of individual study courses, directed reading, and independent research (such as ENVRES 398 Directed Reading in Environment and Resources or ENVRES 399 Directed Research in Environment and Resources). One individual study course, if taken for 3-5 letter-graded units, can be counted as one of the 4 elective courses.
- A maximum of 12 units from approved courses related to the environmental and resource fields from any professional school. One approved professional school course can be counted as one of the four electives.

Joint M.S. and Dual M.S. Course Tracks

Students should consult Stanford Bulletin's ExploreCourses (http://explorecourses.stanford.edu) web site to determine course description, class schedule, location, eligibility, and prerequisites for all courses. Course tracks and other recommended courses are also available on the E-IPER website.

Cleantech

		Units
APPPHYS 219	Solid State Physics Problems in Energy Technology	3
BIOE 355	Advanced Biochemical Engineering	3
CEE 176A	Energy Efficient Buildings	3-4
CEE 176B	Electric Power: Renewables and Efficiency	3-4
CEE 207A	Understanding Energy	3
CEE 226	Life Cycle Assessment for Complex Systems	3-4
CEE 272R	Modern Power Systems Engineering	3
CEE 274A	Environmental Microbiology I	3
CEE 274B	Microbial Bioenergy Systems	3
CHEMENG 274	Environmental Microbiology I	3
CHEMENG 355	Advanced Biochemical Engineering	3
CHEMENG 456	Microbial Bioenergy Systems	3
ECON 155	Environmental Economics and Policy	5
ENERGY 253	Carbon Capture and Sequestration	3-4
ENERGY 267	Engineering Valuation and Appraisal of Oil and Gas Wells, Facilities, and Properties	3
ENERGY 269	Geothermal Reservoir Engineering	3
ENERGY 293C	Energy from Wind and Water Currents	3
MATSCI 302	Solar Cells	3
MATSCI 303	Principles, Materials and Devices of Batteries	3
MATSCI 316	Nanoscale Science, Engineering, and Technology	3
ME 260	Fuel Cell Science and Technology	3
MSE 264	Sustainable Product Development and Manufacturing	3-4

Climate and Atmosphere

		Units
BIO 117	Biology and Global Change	4
CEE 172	Air Quality Management	3
CEE 226	Life Cycle Assessment for Complex Systems	3-4
CEE 263A	Air Pollution Modeling	3-4
CEE 263B	Numerical Weather Prediction	3-4

CEE 263C	Weather and Storms	3
CEE 263D	Air Pollution and Global Warming: History, Science, and Solutions	3
CEE 272S	Green House Gas Mitigation	1-3
CEE 278A	Air Pollution Fundamentals	3
CEE 278C	Indoor Air Quality	2-3
EARTHSYS 111	Biology and Global Change	4
EARTHSYS 246A	Atmosphere, Ocean, and Climate Dynamics: The Atmospheric Circulation	3
EARTHSYS 246B	Atmosphere, Ocean, and Climate Dynamics: the Ocean Circulation	3
ECON 155	Environmental Economics and Policy	5
ENERGY 253	Carbon Capture and Sequestration	3-4
ESS 111	Biology and Global Change	4
ESS 246A	Atmosphere, Ocean, and Climate Dynamics: The Atmospheric Circulation	3
ESS 246B	Atmosphere, Ocean, and Climate Dynamics: the Ocean Circulation	3
GEOPHYS 246A	Atmosphere, Ocean, and Climate Dynamics: The Atmospheric Circulation	3
GEOPHYS 246B	Atmosphere, Ocean, and Climate Dynamics: the Ocean Circulation	3
MSE 294	Climate Policy Analysis	3

Energy

		Units
APPPHYS 219	Solid State Physics Problems in Energy Technology	3
CEE 176A	Energy Efficient Buildings	3-4
CEE 176B	Electric Power: Renewables and Efficiency	3-4
CEE 207A	Understanding Energy	3
CEE 226	Life Cycle Assessment for Complex Systems	3-4
CEE 226E	Advanced Topics in Integrated, Energy-Efficient Building Design	2-3
CEE 255	Introduction to Sensing Networks for CEE	3-4
CEE 256	Building Systems	4
CEE 272R	Modern Power Systems Engineering	3
EARTHSYS 101	Energy and the Environment	3
EARTHSYS 102	Renewable Energy Sources and Greener Energy Processes	3
ECON 155	Environmental Economics and Policy	5
EE 237	Solar Energy Conversion	3
EE 293B	Fundamentals of Energy Processes	3
ENERGY 101	Energy and the Environment	3
ENERGY 102	Renewable Energy Sources and Greener Energy Processes	3
ENERGY 104	Sustainable Energy for 9 Billion	3
ENERGY 120	Fundamentals of Petroleum Engineering	3
ENERGY 226	Thermal Recovery Methods	3
ENERGY 227	Enhanced Oil Recovery	3
ENERGY 253	Carbon Capture and Sequestration	3-4
ENERGY 267	Engineering Valuation and Appraisal of Oil and Gas Wells, Facilities, and Properties	3
ENERGY 269	Geothermal Reservoir Engineering	3
ENERGY 271	Energy Infrastructure, Technology and Economics	3
ENERGY 291	Optimization of Energy Systems	3-4
ENERGY 293B	Fundamentals of Energy Processes	3
ENERGY 293C	Energy from Wind and Water Currents	3
ENGR 120	Fundamentals of Petroleum Engineering	3
GS 253	Petroleum Geology and Exploration	3
IPS 270	The Geopolitics of Energy	3-5
MATSCI 154	Thermodynamic Evaluation of Green Energy Technologies	4
MATSCI 256	Solar Cells, Fuel Cells, and Batteries: Materials for the Energy Solution	3-4
MATSCI 302	Solar Cells	3
MATSCI 303	Principles, Materials and Devices of Batteries	3
MATSCI 316	Nanoscale Science, Engineering, and Technology	3
ME 260	Fuel Cell Science and Technology	3
ME 370A	Energy Systems I: Thermodynamics	3
ME 370B	Energy Systems II: Modeling and Advanced Concepts	4
ME 370C	Energy Systems III: Projects	3-5
MSE 243	Energy and Environmental Policy Analysis	3
MSE 295	Energy Policy Analysis	3

Freshwater

		Units
CEE 101B	Mechanics of Fluids	4
CEE 174A	Providing Safe Water for the Developing and Developed World	3
CEE 174B	Wastewater Treatment: From Disposal to Resource Recovery	3
CEE 177	Aquatic Chemistry and Biology	4
CEE 226	Life Cycle Assessment for Complex Systems	3-4
CEE 260A	Physical Hydrogeology	4
CEE 260C	Contaminant Hydrogeology and Reactive Transport	4
CEE 262A	Hydrodynamics	3-4
CEE 262B	Transport and Mixing in Surface Water Flows	3-4
CEE 264A	Rivers, Streams, and Canals	3-4
CEE 265A	Sustainable Water Resources Development	3
CEE 265C	Water Resources Management	3
CEE 265D	Water and Sanitation in Developing Countries	1-3
CEE 266A	Watersheds and Wetlands	3
CEE 266B	Floods and Droughts, Dams and Aqueducts	3
CEE 266D	Water Resources and Water Hazards Field Trips	2
CEE 268	Groundwater Flow	3-4
CEE 270	Movement and Fate of Organic Contaminants in Waters	3
CEE 271A	Physical and Chemical Treatment Processes	3
CEE 271B	Environmental Biotechnology	4
CEE 273	Aquatic Chemistry	3
CEE 273A	Water Chemistry Laboratory	3
ECON 155	Environmental Economics and Policy	5
ESS 220	Physical Hydrogeology	4
ESS 221	Contaminant Hydrogeology and Reactive Transport	4
ESS 273	Aquaculture and the Environment: Science, History, and Policy	3

Global, Community, and Environmental Health

		Units
ANTHRO 262	Indigenous Peoples and Environmental Problems	3-5
ANTHRO 266	Political Ecology of Tropical Land Use: Conservation, Natural Resource Extraction, and Agribusiness	3-5

ANTHRO 277	Environmental Change and Emerging Infectious Diseases,Japanese Society and Culture	3-5,5
ANTHRO 282	Medical Anthropology	4
BIO 117	Biology and Global Change	4
CEE 174A	Providing Safe Water for the Developing and Developed World	3
CEE 174B	Wastewater Treatment: From Disposal to Resource Recovery	3
CEE 226	Life Cycle Assessment for Complex Systems	3-4
CEE 260C	Contaminant Hydrogeology and Reactive Transport	4
CEE 263A	Air Pollution Modeling	3-4
CEE 263D	Air Pollution and Global Warming: History, Science, and Solutions	3
CEE 265A	Sustainable Water Resources Development	3
CEE 265C	Water Resources Management	3
CEE 265D	Water and Sanitation in Developing Countries	1-3
CEE 270	Movement and Fate of Organic Contaminants in Waters	3
CEE 272	Coastal Contaminants	3-4
CEE 274D	Pathogens and Disinfection	3
CEE 276	Introduction to Human Exposure Analysis	3
CEE 277S	Design for a Sustainable World	1-5
CEE 278A	Air Pollution Fundamentals	3
CEE 278C	Indoor Air Quality	2-3
EARTHSYS 111	Biology and Global Change	4
ECON 155	Environmental Economics and Policy	5
ESS 111	Biology and Global Change	4
ESS 221	Contaminant Hydrogeology and Reactive Transport	4
HUMBIO 153	Parasites and Pestilence: Infectious Public Health Challenges	4
HUMBIO 166	Food and Society: Exploring Eating Behaviors in Social, Environmental, and Policy Context	4

Land Use and Agriculture

		Units
ANTHRO 266	Political Ecology of Tropical Land Use: Conservation, Natural Resource Extraction, and Agribusiness	3-5
BIO 101	Ecology	4
BIO 117	Biology and Global Change	4
BIO 144	Conservation Biology: A Latin American Perspective	3
BIO 375	Field Ecology & Conservation	4
CEE 226	Life Cycle Assessment for Complex Systems	3-4
EARTHSYS 111	Biology and Global Change	4
EARTHSYS 155	Science of Soils	3-4
EARTHSYS 185	Feeding Nine Billion	4-5
EARTHSYS 187	FEED the Change: Redesigning Food Systems	2-3
EARTHSYS 206	World Food Economy	5
EARTHSYS 242	Remote Sensing of Land	4
EARTHSYS 256	Soil and Water Chemistry	1-4
EARTHSYS 281	Urban Agriculture in the Developing World	3-4
EARTHSYS 289A	FEED Lab: Food System Design & Innovation	3-4
ECON 155	Environmental Economics and Policy	5
ECON 206	World Food Economy	5
ESS 111	Biology and Global Change	4
ESS 206	World Food Economy	5
ESS 216	Terrestrial Biogeochemistry	3
ESS 256	Soil and Water Chemistry	1-4
ESS 262	Remote Sensing of Land	4
ESS 273	Aquaculture and the Environment: Science, History, and Policy	3
ESS 280B	Principles and Practices of Sustainable Agriculture	3-4
ESS 281	Urban Agriculture in the Developing World	3-4
HUMBIO 112	Conservation Biology: A Latin American Perspective	3
IPS 274	International Urbanization Seminar: Cross-Cultural Collaboration for Sustainable Urban Development	4-5
URBANST 163	Land Use Control	4
URBANST 165	Sustainable Urban and Regional Transportation Planning	4-5

Oceans and Estuaries

		Units
BIO 274S	Hopkins Microbiology Course	3-12
BIOHOPK 263H	Oceanic Biology	4
BIOHOPK 272H	Marine Ecology: From Organisms to Ecosystems	5
BIOHOPK 273H	Marine Conservation Biology	4
BIOHOPK 274	Hopkins Microbiology Course	3-12
BIOHOPK 285H	Ecology and Conservation of Kelp Forest Communities	5
CEE 226	Life Cycle Assessment for Complex Systems	3-4
CEE 262D	Introduction to Physical Oceanography	4
CEE 272	Coastal Contaminants	3-4
CEE 274S	Hopkins Microbiology Course	3-12
CEE 275A	California Coast: Science, Policy, and Law	3-4
EARTHSYS 241	Remote Sensing of the Oceans	3-4
EARTHSYS 246A	Atmosphere, Ocean, and Climate Dynamics: The Atmospheric Circulation	3
EARTHSYS 246B	Atmosphere, Ocean, and Climate Dynamics: the Ocean Circulation	3
EARTHSYS 252	Marine Chemistry	3-4
EARTHSYS 258	Geomicrobiology	3
EARTHSYS 275	California Coast: Science, Policy, and Law	3-4
ECON 155	Environmental Economics and Policy	5
ESS 244	Marine Ecosystem Modeling	3
ESS 246A	Atmosphere, Ocean, and Climate Dynamics: The Atmospheric Circulation	3
ESS 246B	Atmosphere, Ocean, and Climate Dynamics: the Ocean Circulation	3
ESS 251	Biological Oceanography	3-4
ESS 252	Marine Chemistry	3-4
ESS 253S	Hopkins Microbiology Course	3-12
ESS 258	Geomicrobiology	3
ESS 273	Aquaculture and the Environment: Science, History, and Policy	3
GEOPHYS 246A	Atmosphere, Ocean, and Climate Dynamics: The Atmospheric Circulation	3
GEOPHYS 246B	Atmosphere, Ocean, and Climate Dynamics: the Ocean Circulation	3
LAW 514	California Coast: Science, Policy and Law	4

Sustainable Built Environment

		Units
CEE 100	Managing Sustainable Building Projects	4

CEE 174A	Providing Safe Water for the Developing and Developed World	3
CEE 174B	Wastewater Treatment: From Disposal to Resource Recovery	3
CEE 176A	Energy Efficient Buildings	3-4
CEE 176B	Electric Power: Renewables and Efficiency	3-4
CEE 224A	Sustainable Development Studio	1-5
CEE 226	Life Cycle Assessment for Complex Systems	3-4
CEE 226E	Advanced Topics in Integrated, Energy-Efficient Building Design	2-3
CEE 241A	Infrastructure Project Development	3
CEE 255	Introduction to Sensing Networks for CEE	3-4
CEE 256	Building Systems	4
CEE 265A	Sustainable Water Resources Development	3
CEE 277L	Smart Cities & Communities	2
ECON 155	Environmental Economics and Policy	5
IPS 274	International Urbanization Seminar: Cross-Cultural Collaboration for Sustainable Urban Development	4-5
URBANST 163	Land Use Control	4
URBANST 165	Sustainable Urban and Regional Transportation Planning	4-5

Sustainable Design

		Units
BIOE 281	Biomechanics of Movement	3
CEE 226	Life Cycle Assessment for Complex Systems	3-4
CEE 277S	Design for a Sustainable World	1-5
EARTHSYS 187	FEED the Change: Redesigning Food Systems	2-3
EARTHSYS 289A	FEED Lab: Food System Design & Innovation	3-4
ECON 155	Environmental Economics and Policy	5
ENGR 210	Perspectives in Assistive Technology (ENGR 110)	1-3
ENVRES 380	Collaborating with the Future: Launching Large Scale Sustainable Transformations	3-4
ME 206A	Entrepreneurial Design for Extreme Affordability	4
ME 206B	Entrepreneurial Design for Extreme Affordability	4
ME 216A	Advanced Product Design: Needfinding	3-4
ME 281	Biomechanics of Movement	3
ME 283	Tissue Mechanics and Mechanobiology	3
ME 315	The Designer in Society	3

Master of Science

In exceptional circumstances, E-IPER offers a Master of Science degree for students in E-IPER's Ph.D. program who opt to complete their training with an M.S.degree or who do not advance to candidacy for the Ph.D.degree. Admission directly to the M.S.program is not allowed. Requirements for the M.S. include:

1. Completion of a minimum of 45 units at or above the 100-level, of which 23 units must be at or above the 200-level. Courses numbered under 100 are not allowable.
2. Completion of the E-IPER Ph.D. core curriculum, each with a letter grade of 'B' or higher, comprising:

		Units
ENVRES 300	Introduction to Resource, Energy and Environmental Economics *	3
ENVRES 315	Environmental Research Design Seminar	1
ENVRES 320	Designing Environmental Research	3-4
ENVRES 330 & ENVRES 398	Research Approaches for Environmental Problem Solving and Directed Reading in Environment and Resources	4-13

*Students admitted prior to 2014-15 must consult with E-IPER staff regarding an allowable replacement for this course.

Additional courses may be chosen in consultation with the student's lead advisers. Students must maintain at least a 'B' (3.0) grade point 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 in Environment and Resources

E-IPER's Ph.D. requirements are updated annually and 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 from different areas of research to design a course of study that allows the student to develop and exhibit:

1. 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
2. depth in at least two distinct fields of Inquiry; and
3. interdisciplinary breadth as determined by faculty advisers and student.

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

1. In the first year, completion of the Ph.D. core course sequence:

		Units
EARTH 300	Earth Sciences Seminar	1
ENVRES 300	Introduction to Resource, Energy and Environmental Economics	3
ENVRES 315	Environmental Research Design Seminar	1
ENVRES 320	Designing Environmental Research	3-4
ENVRES 330 & ENVRES 398	Research Approaches for Environmental Problem Solving and Directed Reading in Environment and Resources	4-13

2. Fulfillment of depth in the student's two chosen fields of Inquiry through courses, research, and/or independent studies as determined by the student and his/her faculty advisers and committee members. Fields of Inquiry are the central focus of a student's dissertation research. Students have the freedom to define and choose the fields of Inquiry in which they would like to develop depth of understanding through the course of their Ph.D. and which are distinct enough to ensure that the student's research is interdisciplinary. Each field of Inquiry must be mapped to a corresponding faculty adviser. As part of their qualifying exam, students are required to submit a detailed essay describing: the two fields of Inquiry, mapping these fields of Inquiry from the larger disciplines on which their fields of Inquiry draw; how rigor is understood and achieved in these fields; the importance and applicability of these fields to the student's research questions; and how the student's work will combine these two fields of Inquiry to yield an interdisciplinary research project achieving scholarly rigor.
3. Demonstration of interdisciplinary breadth of knowledge related to environment and resources more broadly in the form of courses, independent study, and/or evidence of proficiency through prior course work or experience. Fulfillment of interdisciplinary breadth

requirement must be certified by the student's lead faculty advisers and committee members.

4. Completion of quarterly meetings with advisers during the first year, and at minimum, annual meetings thereafter.
5. Submission of a candidacy plan by end of Spring Quarter of the second year, for review at the second year committee meeting of the minds and subject to the approval of the student's committee and E-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.
6. Completion of the oral qualifying exam and completion of the requirements for candidacy, including at least 25 letter-graded graduate course units (200 level and above) with at least a 'B' (3.0) average, by the end of Winter Quarter of the third year. The oral qualifying exam committee must 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.
7. 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 appointed in a department outside that of the lead advisers, all of whom are normally Academic Council members. Appointment of a non-Academic Council member must be petitioned and approved by the faculty director.

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

1. Serve as a teaching assistant (TA) 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 but not limited to ENVRES 320 Designing Environmental Research or ENVRES 330 Research Approaches for Environmental Problem Solving. Seminars, including Introductory Seminars, may not be used to fulfill this requirement. 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. On an ongoing basis, submit grant proposals for external funding, defined as fellowship and/or research funds provided by a government agency, a private foundation, or a University entity other than E-IPER or the School of Earth, Energy and Environmental Sciences.
3. Participate each year in a Spring Quarter annual review in which the student and lead advisers submit progress reports for review by the E-IPER academic guidance committee.

Faculty Director: Peter Vitousek (Biology)

Associate Director: Deborah Wojcik

Faculty: Nicole Ardoin (Education, Woods Institute for the Environment), Kevin Arrigo (Earth System Science), Kenneth J. Arrow (Economics, emeritus), Gregory Asner (Global Ecology, Carnegie Institution), Shilajeet Banerjee (Human-Sciences and Technologies Advanced Research Institute), William Barnett (Business), Michele Barry (Medicine, Woods Institute for the Environment), Sally M. Benson (Energy Resources Engineering, Global Climate and Energy Program, Woods Institute for the Environment), Sarah L. 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