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 (https://earth.stanford.edu/eiper).

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

For information on the University's basic requirements for the master's degree, see the "Graduate Degrees (http://exploredegrees.stanford.edu/graduatedegrees)" section of this bulletin.

The Master of Science degree, offered as a joint master's degree or a dual master's degree, is an option only 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. 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.S.-M.B.A degree program requires a total of 129 units: 84 units for the M.B.A. and 45 units for the M.S. (compared to 100 units for the M.B.A. plus 45 units for the M.S. as separate degrees) to be completed over approximately eight academic quarters.

The joint M.S.-J.D. degree program requires a minimum of 113 units; additional units may be necessary to satisfy all requirements. 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: 31 non-Law units allowed within the J.D. degree plus 12 professional school units allowed within the M.S. degree. The joint M.S.-J.D. may be completed in three years.

Each student's program of study focuses on a specific track (see "Joint M.S. and Dual M.S. Course Tracks" below) and is subject to the approval by the student's faculty adviser and E-IPER staff. The joint degree is conferred when the requirements for both the E-IPER M.S. and the professional degree program 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 at least a 'B' average (3.0 grade point average) for all letter-graded courses taken toward the M.S. degree. Professional school letter-graded courses are not included in the E-IPER GPA calculation. The student must complete at least 23 units at the 200 level or above. Courses numbered 1 to 99 are not allowable. For application information, see the Admissions page on the E-IPER website.

1. *Required Courses:* An introductory core course and a capstone project seminar:

		Units
ENVRES 280	Introduction to Environment and Resources	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 may be completed in one quarter (3 units required) or across two quarters (for a total of either 3 or 4 units).

2. *Track Courses:* A minimum of four letter-graded courses from one M.S. course track. Track courses must be taken for a minimum of 3 units. Specific track courses are listed below in the "Joint M.S. and Dual M.S. Course Tracks" section.
   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. *Elective Courses:* At least four 3-5 unit letter-graded elective courses at the 100-level or higher. Elective courses may be taken from the student's selected course track, another course track, or elsewhere in the University, provided that they are relevant to the student's environment and resources course of study.

There are additional restrictions on course work used to fulfill the joint M.S. degree requirements:

- A maximum of 5 units from courses that are identified as primarily consisting of guest lectures, such as the Energy Seminar, may be counted toward the Joint M.S. degree.
- A maximum of 5 units of individual study courses, directed reading and/or independent research units (such as ENVRES 398 Directed Reading in Environment and Resources or ENVRES 399 Directed Research in Environment and Resources) may be counted toward the joint M.S. degree. One individual study course, if taken for 3-5 letter-graded units, may be counted as one of the four elective courses.
- A maximum of 12 units from approved courses related to environmental and resource fields, from any professional school, may be counted toward the joint M.S. degree. One approved professional school course may 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 the M.S. in Environment and Resources dual degree program. 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. typically requires at least three quarters of study in addition to the time required for the student's other degree. For additional information, see the E-IPER web site.

Each student's program of study focuses on a specific track (see "Joint M.S. and Dual M.S. Course Tracks" below) and 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://earth.stanford.edu/eiper/joint-ms-admissions) page on the E-IPER website (https://earth.stanford.edu/eiper).

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 at least a 'B' average (3.0 grade point average) for all letter-graded courses taken toward the M.S. degree. The student must complete at least 23 units at the 200-level or above. Courses numbered 1 to 99 are not allowable.

1. *Required Courses:* An introductory core course and a capstone project seminar:

		Units
ENVRES 280	Introduction to Environment and Resources	2
ENVRES 290	Capstone Project Seminar in Environment and Resources (see '2' below)	1-3

2. The capstone project integrates the student's professional and M.S. degrees and may be completed in one quarter (3 units required) or across two quarters (for a total of either 3 or 4 units).
3. *Track Courses:* A minimum of four letter-graded courses from one M.S. Course Track. Track courses must be taken for a minimum of 3 units. Specific track courses are listed below under Joint M.S. and Dual M.S. Course Tracks.
   - Cleantech
   - Climate and Atmosphere
   - Energy
   - Freshwater
   - Global, Community, and Environmental Health
   - Land Use and Agriculture
   - Oceans and Estuaries
   - Sustainable Built Environment
   - Sustainable Design
4. *Elective Courses:* At least four additional 3-5 unit letter-graded elective courses at the 100 level or higher. Elective courses may be taken from the student's selected course track, another course track, or elsewhere in the University, provided that they are relevant to the student's environment and resources course of study.

There are additional restrictions on course work used to fulfill the dual M.S. degree requirements:

- A maximum of 5 units from courses that are identified as primarily consisting of guest lectures, such as the Energy Seminar 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) may be counted toward the Dual M.S. degree. One individual study course, if taken for 3-5 letter-graded units, may 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, may be counted toward the dual M.S. degree. One approved professional school course may be counted as one of the four electives.

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

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

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	100% Clean, Renewable Energy and Storage for Everything	3-4
CEE 207A	Understanding Energy	3-5
CEE 207R	E^3: Extreme Energy Efficiency	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
CEE 276B	100% Clean, Renewable Energy and Storage for Everything	3-4
CEE 277L	Smart Cities & Communities	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 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 182	Electric Transportation	3

ME 260	Fuel Cell Science and Technology	3
ME 267	Ethics and Equity in Transportation Systems	3

Climate and Atmosphere

		Units
BIO 117	Biology and Global Change	4
BIO 238	Ecosystem Services: Frontiers in the Science of Valuing Nature	3
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 278A	Air Pollution Fundamentals	3
CEE 278C	Indoor Air Quality	2-3
ECON 155	Environmental Economics and Policy	5
ENERGY 253	Carbon Capture and Sequestration	3-4
ESS 246A	Atmosphere, Ocean, and Climate Dynamics: The Atmospheric Circulation	3
ESS 246B	Atmosphere, Ocean, and Climate Dynamics: the Ocean Circulation	3
PHYSICS 199	The Physics of Energy and Climate Change	3

Energy

		Units
APPPHYS 219	Solid State Physics Problems in Energy Technology	3
CEE 176A	Energy Efficient Buildings	3-4
CEE 176B	100% Clean, Renewable Energy and Storage for Everything	3-4
CEE 207A	Understanding Energy	3-5
CEE 207R	E^3: Extreme Energy Efficiency	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
CEE 276B	100% Clean, Renewable Energy and Storage for Everything	3-4
ECON 155	Environmental Economics and Policy	5
EE 237	Solar Energy Conversion	3
ENERGY 101	Energy and the Environment	3
ENERGY 102	Fundamentals of Renewable Power	3
ENERGY 104	Sustainable Energy for 9 Billion	3
ENERGY 120	Fundamentals of Petroleum Engineering	3
ENERGY 204	Achieving Universal Energy Access by 2030: Can it be done?	2-3
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
GEOPHYS 208	Unconventional Reservoir Geomechanics	3
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 182	Electric Transportation	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
MS&E 243	Energy and Environmental Policy Analysis	3
PHYSICS 199	The Physics of Energy and Climate Change	3

Freshwater

		Units
BIO 238	Ecosystem Services: Frontiers in the Science of Valuing Nature	3
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	3
CEE 262A	Hydrodynamics	3-4
CEE 262B	Transport and Mixing in Surface Water Flows	3-4
CEE 262E	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	4
CEE 266B	Floods and Droughts, Dams and Aqueducts	4
CEE 266C	Dams, Reservoirs, and their Sustainability	3
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

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 282	Medical Anthropology	5
BIO 117	Biology and Global Change	4
BIO 238	Ecosystem Services: Frontiers in the Science of Valuing Nature	3
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	3
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	Engineering and Sustainable Development	1-3
CEE 278A	Air Pollution Fundamentals	3
CEE 278C	Indoor Air Quality	2-3
ECON 155	Environmental Economics and Policy	5
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 117	Biology and Global Change	4
BIO 234	Conservation Biology: A Latin American Perspective	3
BIO 238	Ecosystem Services: Frontiers in the Science of Valuing Nature	3
CEE 226	Life Cycle Assessment for Complex Systems	3-4
CEE 275A	California Coast: Science, Policy, and Law	3-4
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 205	Food and Community: Food Security, Resilience and Equity	2-3
EARTHSYS 206	World Food Economy	4
EARTHSYS 276	Open Space Management Practicum	4-5
EARTHSYS 289A	FEED Lab: Food System Design & Innovation	3-4
ECON 155	Environmental Economics and Policy	5
ECON 206	World Food Economy	4
ESS 155	Science of Soils	3-4
ESS 164	Fundamentals of Geographic Information Science (GIS)	3-4
ESS 206	World Food Economy	4
ESS 256	Soil and Water Chemistry	3
ESS 262	Remote Sensing of Land	4
ESS 270	Analyzing land use in a globalized world	3
ESS 280	Principles and Practices of Sustainable Agriculture	3-4
HUMBIO 166	Food and Society: Exploring Eating Behaviors in Social, Environmental, and Policy Context	4
SUST 210	Pursuing Sustainability: Managing Complex Social Environmental Systems	3
URBANST 163	Land Use Control	4
URBANST 165	Sustainable Urban and Regional Transportation Planning	4-5

Oceans and Estuaries

		Units
BIO 238	Ecosystem Services: Frontiers in the Science of Valuing Nature	3
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
ECON 155	Environmental Economics and Policy	5
ESS 241	Remote Sensing of the Oceans	3-4
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 258	Geomicrobiology	3

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	100% Clean, Renewable Energy and Storage for Everything	3-4
CEE 224X	Sustainable Urban Systems Fundamentals	3-5
CEE 224Y	Sustainable Urban Systems Project	1-5
CEE 224Z	Sustainable Urban Systems Project	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 243	Intro to Urban Sys Engrg	3
CEE 255	Introduction to Sensing Networks for CEE	3-4
CEE 256	Building Systems	4
CEE 265A	Sustainable Water Resources Development	3
CEE 276B	100% Clean, Renewable Energy and Storage for Everything	3-4
CEE 277L	Smart Cities & Communities	3
ECON 155	Environmental Economics and Policy	5
ME 267	Ethics and Equity in Transportation Systems	3
URBANST 163	Land Use Control	4
URBANST 165	Sustainable Urban and Regional Transportation Planning	4-5

Sustainable Design

		Units
CEE 226	Life Cycle Assessment for Complex Systems	3-4
CEE 277S	Engineering and Sustainable Development	1-3
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
ENVRES 240	Environmental Decision-Making and Risk Perception	1-3
ENVRES 380	Innovating Large Scale Sustainable Transformations	3-4
ME 206A	Design for Extreme Affordability	4
ME 206B	Design for Extreme Affordability	4
ME 216A	Advanced Product Design: Needfinding	3-4
ME 316B	Design Impact Master's Project II	2-6
ME 377	Design Thinking Studio	4
SUST 210	Pursuing Sustainability: Managing Complex Social Environmental Systems	3

Master of Science

In exceptional circumstances, students in E-IPER's Ph.D. program may opt to complete their training with a Master of Science degree. There is no direct admission to the M.S. degree program. 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 1 to 99 are not allowable.
2. Completion of the E-IPER Ph.D. core curriculum, with a letter grade of 'B' or higher in each course:

		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

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

For information on the University's basic requirements for the Ph.D. degree, see the "Graduate Degrees (http://exploredegrees.stanford.edu/graduatedegrees)" section of this bulletin.

E-IPER updates the Ph.D. requirements annually, laying out the structure of advising meetings, core courses, program activities, and milestones that guide students' progress. Each student works with a faculty advising team from different research areas to design a course of study that allows the student to develop and exhibit:

1. understanding of 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 of knowledge in at least two distinct fields of inquiry; and
3. interdisciplinary breadth as determined by faculty, advising team, and student.

Program-specific Ph.D. requirements, including a timeline to achieve milestones, 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
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	Research Approaches for Environmental Problem Solving	3
ENVRES 398	Directed Reading in Environment and Resources	1-10

2. *Fields of Inquiry:* Fulfillment of depth of knowledge in the student's two chosen fields of inquiry through courses, research, and/or independent studies as determined by the student and their two lead advisers and committee members. Fields of inquiry are central to the student's dissertation research. Students have the freedom to define and choose the two fields of inquiry in which they develop depth of understanding throughout their Ph.D. program; the fields must be distinct from one another to ensure that the student's research is interdisciplinary. Each field of inquiry is associated with a specific lead adviser.

As part of the qualifying exam, each student is required to submit a detailed essay describing:

- the two fields of inquiry, explaining the development of these fields, and their relationship to the larger disciplines from which they are drawn;
- 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 produce an interdisciplinary research project that demonstrates scholarly rigor.

1. Demonstration of an interdisciplinary breadth of knowledge that is more broadly related to environment and resources; this may be in the form of courses, independent study, and/or evidence of proficiency through prior course work or other experience. Fulfillment of the interdisciplinary breadth requirement must be certified by the student's lead faculty advisers and committee members.
2. Completion of quarterly meetings with advisers during the first year, and at minimum, annual meetings thereafter.
3. Submission of a candidacy plan for review at the second-year committee meeting and subject to the approval of that plan by the student's committee and E-IPER's faculty director. The candidacy plan documents how the student has fulfilled the program requirements to date and includes a summary of research ideas and a list of faculty who might serve as qualifying exam committee members.
4. Completion of the oral qualifying examination 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. The qualifying exam committee must include the student's two lead advisers and two to three other faculty members with expertise in the student's research area. The majority of the qualifying exam committee should be members of the Stanford Academic Council; the chair of the committee must be a Stanford 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.
5. 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 (http://exploredegrees.stanford.edu/graduatedegrees)" section of this bulletin. The University oral examination committee comprises the student's two lead advisers, at least two additional members, and a chair whose academic appointment is in a department outside that of the lead advisers. Normally, all committee members are 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, as a discussion section leader 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.

Graduate Advising Expectations

The Program in Environment and Resources is committed to providing academic advising in support of graduate student scholarly and professional development. When most effective, this advising relationship entails collaborative and sustained engagement by both the adviser and the advisee. As a best practice, advising expectations should be periodically discussed and reviewed to ensure mutual understanding. Both the adviser and the advisee are expected to maintain professionalism and integrity.

Faculty advisers guide students in key areas such as selecting courses, designing and conducting research, developing of teaching pedagogy, navigating policies and degree requirements, and exploring academic opportunities and professional pathways.

Graduate students are active contributors to the advising relationship, proactively seeking academic and professional guidance and taking responsibility for informing themselves of policies and degree requirements for their graduate program.

For a statement of University policy on graduate advising, see the "Graduate Advising (http://exploredegrees.stanford.edu/graduatedegrees/#advisingandcredentialstext)" section of this bulletin.

Faculty Director: Peter Vitousek

Acting Faculty Director *(Autumn 2018) Nicole Ardoin*

Associate Director: Susannah Barsom

Anthropology: Lisa Curran, William H. Durham, Anne Ehrlich, James Ferguson, Lynn Meskell, Krish Seetah, Michael Wilcox

Biology: Barbara Block, Larry B. Crowder, Gretchen C. Daily, Giulio De Leo, Rodolfo Dirzo, Paul Ehrlich, Christopher Field, Tadashi Fukami, Elizabeth Hadly, Donald Kennedy, Harold Mooney, Erin Mordecai, Stephen Palumbi, Kabir Peay, Robert Sapolsky, Shripad Tuljapurkar, Peter Vitousek

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