The programs in Energy, Environmental, and Food Economics (EEFE) are designed to educate students as applied research economists in the fields of energy economics, environment and natural resource economics, and industrial organization in the food sector. The EEFE graduate program offers Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) degrees. Through completion of advanced course work and rigorous skills training, the Ph.D. and M.S. programs will prepare students to conduct independent research in accordance with the highest ethical standards, scientific integrity, and interpersonal collegiality, and to effectively interpret and communicate the results of their research. The M.S. degree is a research-oriented degree. Thus, a strong component of the M.S. candidate's program includes training in scientific methods as well as techniques of analysis applicable to the field. Additional depth and breadth of training required in the EEFE Ph.D. curriculum will prepare students to conduct original research that advances scientific knowledge in their fields of specialization. Students will also acquire the background and skills necessary to be effective teachers, mentors, and practitioners of economics. As an intercollege graduate program, EEFE faculty members reside in several Penn State departments and Colleges. Students in the program have access to and utilize resources of the participating departments (courses, faculties and facilities).

**Admission Requirements**

Applicants apply for admission to the program via the Graduate School application for admission (http://gradschool.psu.edu/prospective-students/how-to-apply). Requirements listed here are in addition to Graduate Council policies listed under GCAC-300 Admissions (http://gradschool.psu.edu/graduate-education-policies). Scores from the Graduate Record Examinations (GRE), or from a comparable substitute examination accepted by the graduate program, are required for admission. At the discretion of a graduate program, a student may be admitted provisionally (http://gradschool.psu.edu/graduate-education-policies/gcac/gcac-300/provisional-admission) for graduate study in a program without these scores. Letters of recommendation and an applicant's statement of purpose are also required.

Students admitted to the M.S. program are expected to have:

- At least 9 credits in economics, including intermediate undergraduate microeconomic theory and intermediate undergraduate macroeconomic theory.
- Introductory statistics and two semesters of calculus.
- A minimum 3.00 junior/senior GPA (on a 4.00 scale).

Promising students with special backgrounds, abilities, and interests who do not meet these requirements may be admitted provisionally (http://gradschool.psu.edu/graduate-education-policies/gcac/gcac-300/provisional-admission) at the discretion of the program. Students provisionally admitted (http://gradschool.psu.edu/graduate-education-policies/gcac/gcac-300/provisional-admission) to the program are required to acquire the necessary background skills in economics, mathematics and statistics once they join the program.

Students admitted to the Ph.D. program are in general expected, though not required, to have a master's degree in economics, agricultural economics, resource economics or other closely related field. Consistent with this general expectation, students admitted to the Ph.D. program should have course work in:

- Differential and integral calculus, and linear algebra.
- Master's-level economic theory.
- Master's-level statistics/econometrics.

Students admitted to the Ph.D. program are also expected to have a minimum 3.00 Grade Point Average (GPA) in master’s-level course work (on a 4.00 scale). Exceptions to the minimum 3.00 GPA may be made for students with special backgrounds, abilities, and interests at the discretion of the program. Promising students who seek to enter the Ph.D. program but who have course work deficiencies may be admitted to the M.S. program and subsequently apply to the Ph.D. program after successfully eliminating the deficiencies. Completion of the M.S. degree is not required of students admitted to the Ph.D. program from the M.S. program. The expected time to completion of the Ph.D. for students without course work deficiencies is 3.5 to 4 years.

**Degree Requirements**

**Master of Science (M.S.)**

Requirements listed here are in addition to Graduate Council policies listed under GCAC-600 Research Degree Requirements. (http://gradschool.psu.edu/graduate-education-policies)

A minimum of 30 credits at the 500 and 600 level is required for the EEFE M.S. degree, including 6 credits of research (EEFE 600 or EEFE 610). Courses taken to remove deficiencies in preparation may extend the minimum number of credits required. A minor is not required. EEFE M.S. students are required to write a thesis and to pass a final oral examination as part of the requirements for the degree. The thesis must be accepted by the advisers and/or committee members, the head of the graduate program, and the Graduate School.

<table>
<thead>
<tr>
<th>Code</th>
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<tr>
<td>EEFE 510</td>
<td>Econometrics I</td>
<td>3</td>
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<tr>
<td>EEFE 511</td>
<td>Econometrics II</td>
<td>3</td>
</tr>
<tr>
<td>EEFE 512</td>
<td>Applied Microeconomic Theory I</td>
<td>3</td>
</tr>
<tr>
<td>EEFE 527</td>
<td>Quantitative Methods I</td>
<td>3</td>
</tr>
<tr>
<td>EEFE 529</td>
<td>Foundations of Economic Welfare Analysis</td>
<td>3</td>
</tr>
</tbody>
</table>
Electives
9 credits of field electives taught at the 500 level. These courses will be chosen in consultation with the student's academic adviser and cannot include readings or independent study courses (596s).

Culminating Experience
EEFE 600 Thesis research 6
or EEFE 610

Total Credits 30

M.S. degree students must complete Scholarship and Research Integrity (SARI) Training (10 hours).

Doctor of Philosophy (Ph.D.)
Requirements listed here are in addition to Graduate Council policies listed under GCAC-600 Research Degree Requirements. (http://gradschool.psu.edu/graduate-education-policies)

Students in the EEFE Ph.D. program will be required to complete 36 credits of course work at the 500- and 600-level, write and successfully defend a second year paper, write and successfully defend a Ph.D. dissertation, and pass a qualifying examination and a comprehensive examination. The dissertation must be accepted by the dissertation committee, the head of the graduate program, and the Graduate School.

Course work requirements include 21 credits of core course work, at least 12 credits of field courses, and 3 credits of elective courses selected from a list of approved electives maintained by the program office.

<table>
<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>ECON 502</td>
<td>Microeconomic Analysis ¹</td>
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<td>EEFE 510</td>
<td>Econometrics I</td>
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<td>EEFE 511</td>
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<td>ECON 521</td>
<td>Advanced Microeconomic Theory</td>
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<tr>
<td>EEFE 527</td>
<td>Quantitative Methods I</td>
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</tr>
<tr>
<td>AEREC 533</td>
<td>Rural Development Research Methods and Topics</td>
<td>3</td>
</tr>
<tr>
<td>EEFE 529</td>
<td>Foundations of Economic Welfare Analysis</td>
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</tr>
</tbody>
</table>

Ph.D. Field Course Requirements
Two fields consisting of a minimum of 6 credits each from designated courses. 12

Energy Economics, Policy and Systems
ENNEC 540 Economic Analysis of Energy Markets
ENNEC 560 Mineral and Energy Finance I

Environment and Natural Resource Economics
EEFE 519 Resource and Environmental Economics I
EEFE 541 Resource and Environmental Economics II

Food Industrial Organization
AEREC 503 Agricultural Marketing
EEFE 536 Economics of Food Behavior and Health

Electives
A minimum of 3 credits at the 500 level, of which 3 credits must be selected from the following list:
EEFE 531 Applied Microeconometrics I 3
or ENNEC 541 Economics of Energy and the Environment

Total Credits 36

¹ Students selecting the Energy Systems Field may petition to substitute EME 501 for ECON 502.

Ph.D. degree students must also complete Scholarship and Research Integrity (SARI) Training (10 hours).

Dual-Titles

Dual-Title M.S. and Ph.D. in Energy, Environmental, and Food Economics and Demography
Requirements listed here are in addition to requirements listed in GCAC-208 Dual-Title Graduate Degree Programs (http://gradschool.psu.edu/graduate-education-policies/gcac/gcac-200/gcac-208-dual-title-graduate-degree-programs).

Admissions Requirements
Students must apply and be admitted to the graduate program in EEFE and The Graduate School before they can apply for admission to the dual-title degree program. After admission to their primary program, students must apply for admission to and meet the admissions requirements of the Demography dual-title program. Refer to the Admission Requirements section of the Demography Bulletin page (http://bulletins.psu.edu/graduate/programs/majors/demography). Doctoral students must apply for enrollment into the dual-title degree program in Demography prior to taking the qualifying examination in EEFE.

Degree Requirements
To qualify for the dual-title degree, students must satisfy the degree requirements for the degree they are enrolled in EEFE. In addition, students pursuing the dual-title Ph.D. in EEFE and Demography must complete the degree requirements for the dual-title in Demography, listed on the Demography Bulletin page (http://bulletins.psu.edu/graduate/programs/majors/demography).

The qualifying examination committee for the dual-title Ph.D. degree will be composed of Graduate Faculty from EEFE and must include at least one Graduate Faculty member from the Demography program. Faculty members who hold appointments in both programs' Graduate Faculty may serve in a combined role. There will be a single qualifying examination, containing elements of both EEFE and Demography. Dual-title graduate degree students may require an additional semester to fulfill requirements for both areas of study and, therefore, the qualifying examination may be delayed one semester beyond the normal period allowable.

In addition to the general Graduate Council requirements for dissertation committees (http://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/phd-dissertation-committee-formation), the dissertation committee of an EEFE and Demography dual-title doctoral degree student must include at least one member of Demography Graduate Faculty. Faculty members who hold appointments in both programs' Graduate Faculty may serve in a combined role. If the chair of the dissertation committee is not also a member of the Graduate Faculty in Demography, the member of the committee representing Demography must be appointed as co-chair. The Demography representative on the student's dissertation committee will develop questions for and participate in the evaluation of the comprehensive examination.

Students enrolled in the dual-title program are required to write and orally defend a dissertation on a topic that reflects their original research and education in EEFE and Demography. Upon completion of the doctoral dissertation, the candidate must pass a final oral examination (the
dissertation defense) to earn the Ph.D. degree. The dissertation must be accepted by the dissertation committee, the head of the graduate program, and the Graduate School.

**Dual-Title M.S. and Ph.D. in Energy, Environmental, and Food Economics and Operations Research**

Requirements listed here are in addition to requirements listed in GCAC-208 Dual-Title Graduate Degree Programs (http://gradschool.psu.edu/graduate-education-policies/gcac/gcac-200/gcac-208-dual-title-graduate-degree-programs).

**Admissions Requirements**

Students must apply and be admitted to the graduate program in EEFE and The Graduate School before they can apply for admission to the dual-title degree program. After admission to their primary program, students must apply for admission to and meet the admissions requirements of the Operations Research dual-title program. Refer to the Admission Requirements section of the Operations Research Bulletin page (http://bulletins.psu.edu/graduate/programs/majors/operations-research). Doctoral students must apply for enrollment into the dual-title degree program in Operations Research prior to taking the qualifying examination in EEFE.

**Degree Requirements**

To qualify for the dual-title degree, students must satisfy the degree requirements for the degree they are enrolled in EEFE. In addition, students pursuing the dual-title Ph.D. in EEFE and Operations Research must complete the degree requirements for the dual-title in Operations Research, listed on the Operations Research Bulletin page (http://bulletins.psu.edu/graduate/programs/majors/operations-research).

The qualifying examination committee for the dual-title Ph.D. degree will be composed of Graduate Faculty from EEFE and must include at least one Graduate Faculty member from the Operations Research program. Faculty members who hold appointments in both programs’ Graduate Faculty may serve in a combined role. There will be a single qualifying examination, containing elements of both EEFE and Operations Research. Dual-title graduate degree students may require an additional semester to fulfill requirements for both areas of study and, therefore, the qualifying examination may be delayed one semester beyond the normal period allowable.

In addition to the general Graduate Council requirements for dissertation committees (http://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/phd-dissertation-committee-formation), the dissertation committee of an EEFE and Operations Research dual-title doctoral degree student must include at least one member of Operations Research Graduate Faculty. Faculty members who hold appointments in both programs’ Graduate Faculty may serve in a combined role. If the chair of the dissertation committee is not also a member of the Graduate Faculty in Operations Research, the member of the committee representing Operations Research must be appointed as co-chair. The Operations Research representative on the student’s dissertation committee will develop questions for and participate in the evaluation of the comprehensive examination.

Students enrolled in the dual-title program are required to write and orally defend a dissertation on a topic that reflects their original research and education in EEFE and Operations Research. Upon completion of the doctoral dissertation, the candidate must pass a final oral examination (the dissertation defense) to earn the Ph.D. degree. The dissertation must be accepted by the dissertation committee, the head of the graduate program, and the Graduate School.

**Student Aid**

Graduate assistantships available to students in this program and other forms of student aid are described in the Tuition & Funding (http://gradschool.psu.edu/graduate-funding) section of The Graduate School’s website. Students on graduate assistantships must adhere to the course load limits (http://gradschool.psu.edu/graduate-education-policies/gsad/gsad-500/gsad-501-credit-loads-graduate-assistants) set by The Graduate School.

**Courses**

Graduate courses carry numbers from 500 to 699 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

Agricultural Economics and Rural Sociology (AEREC) Course List (https://bulletins.psu.edu/university-course-descriptions/graduate/aerec)

Energy, Environmental, and Food Economics (EEFE) Course List (https://bulletins.psu.edu/university-course-descriptions/graduate/eefe)

**Contact**

<table>
<thead>
<tr>
<th>Campus</th>
<th>University Park</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Graduate Program Head</strong></td>
<td>Edward C Jaenicke</td>
</tr>
<tr>
<td><strong>Director of Graduate Studies (DGS) or Professor-in-Charge (PIC)</strong></td>
<td>Edward C Jaenicke</td>
</tr>
<tr>
<td><strong>Program Contact</strong></td>
<td>Michelle Lynn Barnyak</td>
</tr>
<tr>
<td></td>
<td>201 Armsby Bldg</td>
</tr>
<tr>
<td></td>
<td>University Park PA 16802</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:mlf1@psu.edu">mlf1@psu.edu</a></td>
</tr>
<tr>
<td></td>
<td>(814) 865-0456</td>
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<tr>
<td><strong>Program Website</strong></td>
<td>View (<a href="http://aese.psu.edu/graduateprograms/eefe">http://aese.psu.edu/graduateprograms/eefe</a>)</td>
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</table>