

ENVIRONMENTAL ENGINEERING GRADUATE PROGRAM HANDBOOK

Effective Fall 2026

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PennState

Master of Engineering (M.Eng.)

Master of Science (M.S.)

Doctor of Philosophy (Ph.D.)

Department of Civil and Environmental Engineering
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PART 1: INTRODUCTION

Program Overview

The Civil and Environmental Engineering (CEE) Department has two distinct graduate degree programs, Civil Engineering and Environmental Engineering. Each program offers three graduate degrees: Master of Engineering (M.Eng.), Master of Science (M.S.), and Doctor of Philosophy (Ph.D.). The M.Eng. degree is a coursework-only program designed for completion within one year for students seeking an advanced degree to enter professional practice. The M.S. degree is for students interested in conducting research in a specialization area within CEE and typically requires two years to thesis completion. The Ph.D. degree is intended for students seeking in-depth knowledge in a specialization area within CEE and completing dissertation research at a level above that for an M.S. degree. Interdisciplinary programs can also be pursued, and the Environmental Engineering program offers a Dual-Title Ph.D. in Biogeochemistry.

Each of the graduate degrees requires the student to meet specific requirements of both the Pennsylvania State University J. Jeffrey and Ann Marie Fox Graduate School (Fox Graduate School) and the CEE Department. **This handbook describes the departmental requirements for the Environmental Engineering program (program code ENV_E).** For Fox Graduate School degree requirements and graduate education policies, students are advised to consult the Graduate Bulletin at <https://bulletins.psu.edu/graduate/>.

Students should direct specific inquiries with respect to the CEE graduate programs to:

Director of Graduate Studies

Dr. John (Jay) Regan
N-277 ECoRE Building
University Park, PA 16802
814-865-9436, jmr41@psu.edu

Graduate Program Support Coordinator

Ms. Ashton Romine
208B ECoRE Building
University Park, PA 16802
814-863-3085, alh6847@psu.edu

Facilities and Support Staff

The research mission of the CEE graduate programs is supported by state-of-the-art facilities located at the Engineering Collaborative Research and Education (ECoRE) Building, the Civil Infrastructure Testing and Evaluation Laboratory (CITEL), the Kappe Environmental Engineering Laboratory, and the Larson Transportation Institute (LTI) Test Track. Several institutes and centers support research activities, particularly the LTI, the Penn State Institutes of Energy and the Environment (PSIEE), the Materials Research Institute (MRI), and the Pennsylvania Housing Research Center (PHRC).

The CEE Graduate & Undergraduate Academic Programs Offices manage all departmental undergraduate programs, graduate programs, scholarships and fellowships, course and classroom scheduling, and web page administration. An IT Consultant and IT Support Assistant provide IT support for the computer network and large number of computers operated within

the department. A laboratory supervisor and technician are available to provide support for instruction and research in the departmental laboratories. Additional technical staff provide support for research conducted at other research laboratories housed outside the CEE Department. Additional staff support the departmental central office and research centers housed within the CEE Department.

PART 2: ADMISSION AND ENTRANCE REQUIREMENTS

Admission Requirements

For any graduate degree offered by the CEE Department, applicants should possess a baccalaureate degree in engineering from a regionally accredited institution. Students without a baccalaureate degree in engineering may be admitted on a provisional basis pending successful completion of entrance requirements (completed concurrently with degree requirements and listed below). Students in engineering, physical sciences, or mathematics with a 3.00 grade-point average (on a 4.00 scale) may be considered for admission. Exceptions to the minimum 3.00 grade-point average may be made for students with special backgrounds, abilities, and interests.

Prospective students apply to our graduate programs through the Fox Graduate School Online Application portal. All applicants will upload unofficial copies of their transcripts, a personal statement of objectives, a resume if desired, and three references for letters of recommendation. Graduate Record Examinations (GRE) Aptitude Test (verbal, quantitative, and analytical) scores are strongly recommended but are not required. If admitted, applicants will be required to provide the Fox Graduate School with OFFICIAL transcripts of all their previous coursework (in duplicate), and international applicants will be required to provide official transcripts (or attested copies), degree, and diploma certificates in **both English and native language**. Photocopies will NOT be accepted.

All international applicants whose native language is not English must submit scores for the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System). The minimum acceptable score for the TOEFL is 4.5, with at least a 3.5 on the speaking section for the internet-based test (iBT). (TOEFL results prior to January 21, 2026 must have a total score of at least 80 with at least a 19 on the speaking section for the iBT.) The minimum composite score for the IELTS is 6.5. Applicants with a TOEFL score of at least 4.5 and an iBT speaking score of 3 (or at least 80 with an iBT speaking score of 16 to 18 for TOEFL results prior to January 21, 2026) or an IELTS composite score of 6.0 may be considered for provisional admission, which requires completion of specified remedial English courses ESL 114G (American Oral English for Academic Purposes) and/or ESL 116G (ESL/Composition for Academic Disciplines) and attainment of a grade of B or higher. International applicants who have received a baccalaureate or graduate degree from a college, university, or institution in a country in which English is the predominant language are exempt from the TOEFL requirement. The Fox Graduate School maintains a list of countries satisfying that requirement: <https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-300/gcac-305-admission-requirements-international-students/admission-requirements-international-students-procedure>.

Additional details about the Fox Graduate School requirements for applications and admissions are provided at <http://gradschool.psu.edu/index.cfm/graduate-admissions/how-to-apply/new-applicants/requirements-for-graduate-admission/>.

Change of Degree

Occasionally, a graduate student who has been admitted for an academic degree program may wish to change to another CEE program (e.g., from M.S. to Ph.D.). In that case, the student should:

- discuss with their advisor,
- contact the CEE Graduate Program Support Coordinator, and
- complete a “Resume Study/Change of Degree or Major” form and submit the request to the Fox Graduate School Office of Graduate Enrollment Services for approval.

Requests to change degree program are reviewed by department faculty in a similar manner as new applications, but with additional emphasis placed on performance in their current program.

M.Eng. and M.S. Entrance Requirements

Students without a baccalaureate degree in engineering must successfully complete entrance requirements (completed prior to or concurrently with degree requirements), shown in Table 2.1 for Environmental Engineering. Students must take all entrance requirements on an A/F basis and earn a B or better. Students may petition to use other related courses to satisfy these requirements or substitute relevant work experience. Students are encouraged to meet with their academic advisor to discuss these requirements or to contact the department prior to application.

Ph.D. Entrance Requirements

Ph.D. applicants who begin their program after completion of an ENV_E Master’s degree (M.Eng. or M.S.) have typically previously met all entrance requirements as well as the core course requirements for environmental engineering (detailed in Table 6.1). Exceptional applicants are encouraged to apply for Direct Entry into the Ph.D. program (i.e. entering the program without first completing a Master’s degree). In that case, the core course requirements (Table 6.1) will be integrated into the Ph.D. program Plan of Study, or the student may complete a “master’s-along-the-way” to the Ph.D. Direct-entry Ph.D. students must also meet the entrance requirements in Table 2.1.

Admissions Assessment Considerations

The Pennsylvania State University is committed to an equal access policy for all persons, assuring equal access to programs, facilities, admission, and employment without regard to personal characteristics not related to ability, performance, or qualifications as determined by University policy or by state or federal authorities. It is the policy of the University to maintain an academic and work environment free of discrimination, including harassment. The Pennsylvania State University prohibits discrimination and harassment against any person because of age, ancestry, color, disability or handicap, national origin, race, religious creed, sex, sexual orientation, or veteran status. Direct all inquiries regarding the nondiscrimination policy to: Office of Equal

Opportunity and Access, 227 W Beaver Avenue; Suite 502 Rider Building, State College, PA 16801;
Phone: (814) 863-0471, Email: oeoa@psu.edu.

Table 2.1. Entrance requirements for students without a B.S. engineering degree applying to the M.Eng., M.S., or Direct Ph.D. in Environmental Engineering.

Course Topics	Equivalent Penn State Courses
Advanced mathematics typical of engineering undergraduate programs (calculus through partial differential equations)	MATH 140 Calculus with Analytic Geometry I; and MATH 141 Calculus with Analytic Geometry II; and MATH 251 Ordinary and Partial Differential Equations
One lecture course in chemistry	CHEM 110 Chemical Principles I
One semester of physics	PHYS 211 General Physics: Mechanics; or PHYS 212 General Physics: Electricity and Magnetism
One course in fluid hydraulics or mechanics	C E 360 Fluid Mechanics; or an equivalent course
One introductory course in environmental engineering	CE 370 Introduction to Environmental Engineering; or CE 371 Water and Wastewater Treatment

PART 3: ADMISSION TO PROGRAM AND INITIAL PROGRESSION

Advisor and Student Responsibilities

All CEE graduate students are required to have an academic advisor, who acts as the student's primary academic and career mentor at Penn State. Upon admission to a CEE graduate program, students for whom an advisor was not already identified will be assigned an interim academic advisor by the respective technical area coordinator. The eventual advisor will be based on mutual career and research interests of the student and faculty. All academic advisors are full-time CEE faculty with Graduate Faculty status or occasionally full-time faculty in other units with CEE Graduate Faculty status.

The advisor's primary responsibilities are to: (1) assist in the development of an *Advanced Degree Course Plan*; (2) advise on and approve selection of course(s) each semester; (3) advise and assist on design and execution of research activities (M.S. and Ph.D.); (4) advise and assist in preparing the student for the qualifying and comprehensive examinations (Ph.D.); (5) assist with professional development activities (internships, attending and presenting at conferences, authorship of journal articles and conference proceedings, developing teaching portfolios, etc.) that would enhance academic preparedness and career prospects; and (6) serve as the chair (or co-chair) of the student's thesis (for M.S.) or doctoral (for Ph.D.) committee.

Communication between the graduate student, the advisor, and the thesis/doctoral committee is a key factor in the progression through the graduate program. It is the student's responsibility to consult with their advisor and committee regularly throughout the course of study.

It is the responsibility of the student to read, understand, and discuss Penn State's Graduate Education policies, as well as the CEE Department procedures and policies presented in this Handbook, with their advisor. The most current Fox Graduate School policies are provided at <http://gradschool.psu.edu/graduate-education-policies/>.

Changing Advisors

A student may change their academic advisor. Either the student or the academic advisor may suggest this change. Proposed changes should be discussed between the affected parties prior to any official action. An advisor change must be made with the consent of the student, the new advisor, and the current advisor. Notification will need to be made to the Graduate Program Support Coordinator in the Academic Programs office, 208 ECoRE Building.

Developing a Plan of Study

All CEE graduate students are required to develop an *Advanced Degree Course Plan* for each of the M.Eng., M.S., and Ph.D. degrees early in the program, by the end of the first semester for M.Eng. and M.S. and no later than the end of the second semester of study for Ph.D. In developing the plan, students are assisted by their academic advisor. Doctoral students must submit an *Advanced Degree Course Plan* by or before their Qualifying Exam. In addition, doctoral

students must develop in-depth understanding of research methods suitable to their area of specialization, and conduct an independent and original research study – the dissertation. Master’s and doctoral students are expected to develop a broad knowledge of the field of environmental engineering, as well as a general knowledge of research designs and methods, demonstrating the suitability of designs and methods for the thesis or dissertation. Requirements for all the graduate degrees are specified in this handbook.

RECR Requirements

All graduate students (M.Eng., M.S., and Ph.D.) must complete Responsible and Ethical Conduct of Research (RECR) training requirements. (Note: this was formerly Scholarship and Research Integrity (SARI) and changed to RECR in Fall 2026.) The RECR program at Penn State is designed to offer graduate students comprehensive, multilevel training in the responsible conduct of research (RCR) through a two-part program: (1) an online RCR module within the CITI program (<https://citi.psu.edu/>) to be completed in the first semester of graduate study and (2) five hours of discussion-based RECR training within the first two years of graduate studies and prior to degree completion. Of the five hours of discussion-based RECR training, 2.5 hours are completed through the CEE Department at the new graduate student orientation before each fall semester, and the remaining 2.5 hours are completed through the Office of Research Protection (ORP) orientation session (0.5 hours) and workshops and events offered throughout the fall and spring semesters. Completion of these RECR requirements is recorded and certified by the Director of Graduate Studies and the Graduate Program Support Coordinator and is a requirement for graduation.

Support Services

Penn State is committed to providing access to students with disabilities to the university’s graduate programs. The Office for Student Disability Resources (SDR) offers support specifically tailored to the needs of graduate students. The office considers the need for accommodations in the following areas: 1) graduate assistantship accommodations; 2) coursework accommodations; 3) lab, fieldwork, and clinical work accommodations; 4) qualifying / comprehensive exams accommodations; and 5) thesis / dissertation accommodations. An overview of disability resources specific to graduate students can be found here: <https://equity.psu.edu/offices/student-disability-resources/graduate-students-with-disabilities>

To be considered for reasonable accommodations, students are required to contact the SDR office, participate in an intake interview, provide documentation, and complete the registration process. Students should be aware that it may take time to go through the intake process, and that they may not know in advance whether accommodations will be needed either for their coursework or for their milestone exams. We thus recommend that students register with SDR for any eligible disabilities in advance, ensuring that all documentation is in place should accommodations be needed at any point during their graduate program. Students can register with SDR and choose not to request accommodations once registered.

Once registered, students can approach course instructors (for course accommodations) and/or the Director of Graduate Studies (for accommodations to other program requirements, including benchmark examinations) to request accommodations. For milestone examinations, this process is required for each milestone examination for which you request accommodations. Specific accommodations are determined through an interactive process and tailored to each student's needs with the goals of upholding rigor and disciplinary expectations in each of the distinct components of graduate education.

Students who would like accommodations for academic events (such as non-course-based department colloquia or seminars) that are not covered under the official SDR categories are encouraged to express these needs to the Director of Graduate Studies and/or SDR.

Penn State has many additional venues for supporting graduate students; a partial list follows:

The Commission for Adult Learners (CALs) provides assistance to adult students who wish to improve their skills in areas such as computers, math, and writing. Detailed information about CALs is located at: <http://cal.psu.edu/>

The Graduate & Professional Student Association (GPSA) provides graduate students with information on topics such as taxes and health care options, babysitters and typists/editors. Detailed information about GPSA is located at: <http://gpsa.psu.edu/about-the-gpsa/>

Penn State Human Resources provides services for students with a family. Descriptions of the programs offered are available at: <https://ohr.psu.edu/employee-and-family-resources>

The Gender Equity Center (GenEQ) supports students who have been impacted by sexual violence, relationship violence, stalking, harassment, and other campus climate issues. More information on the GenEQ is located at: <http://sites.psu.edu/genderequity/>

The Women in Engineering Program (WEP) actively promotes an equitable and productive academic environment in the College of Engineering. More information on WEP is located at: <http://psuengineeringdiversity.com/wep/>

Information pertaining to other student services are available on the Graduate School website: <http://bulletins.psu.edu/bulletins/whitebook/>

PART 4: GRADUATE SCHOOL DEGREE REQUIREMENTS

The Pennsylvania State University Fox Graduate School publishes minimum requirements for all graduate degrees awarded by the University. Additional graduate degree requirements are established by the College of Engineering, the CEE Department, and programs within CEE. Fox Graduate School graduate degree requirements and policies are published on the Graduate School website in the Graduate Degree Bulletin at <https://bulletins.psu.edu/graduate/>. **It is the responsibility of the student to read, understand, and discuss these requirements and policies, as well as the CEE Department requirements presented in this Handbook, with their academic advisor, and if applicable, thesis advisor.** The Penn State University Fox Graduate School graduate degree requirements and policies supersede any conflicting requirements. They address issues related to the following:

M.Eng. & M.S. specific requirements:

- minimum grade-point average required for graduation
- maintaining good academic standing
- M.Eng. time limitation
- M.S. time limitation
- advanced standing and transfer credits

Ph.D. specific requirements:

- general requirements
- time limitation to complete the program
- off campus and transfer credit
- advisors and doctoral committees
- English competency
- qualifying, comprehensive, and final examination
- dissertation acceptance
- residence requirements
- continuous registration requirements

Responsible and Ethical Conduct of Research (RECR) requirements for all graduate students:

- Online CITI RCR module (completed the first semester of study)
- 5 hours of discussion-based training (2.5 hours from CEE orientation, 2.5 hours of ORP offerings)

The above summary is not exhaustive and does not include Departmental and program requirements that may be in addition to the Fox Graduate School requirements. All graduate students in the CEE Department are strongly encouraged to familiarize themselves with all Fox Graduate School degree requirements. The Fox Graduate School also publishes deadlines each semester for specific degree and graduation-related requirements, which can be found here: <https://gradschool.psu.edu/academics/academic-dates-and-deadlines>

PART 5: MASTER OF ENGINEERING REQUIREMENTS

The following policies and procedures have been adopted by the CEE Department to supplement the *Procedures and Regulations* contained in the *Graduate Degree Programs Bulletin*. These requirements apply to all M. Eng. degree students in the Environmental Engineering program.

Degree Description and Credit Requirements

The M.Eng. degree is a non-thesis professional master's degree. The program provides training for advanced professional practice. A minimum 30 graduate credits (400 level and above) of coursework are required. At least 18 credits must be earned in graduate courses (500 and 800 level) and at least 12 credits must be earned in courses with the CE prefix. A minimum of 20 credits must be earned at the University Park campus. All students are required to take CE 835 Integrated Project Management for Civil Engineering (offered Spring only) to fulfill the requirement for a culminating experience. Students are allowed to take up to 3 credits of CE 596 Independent Study with the agreement of a supervising faculty member. All students are required to complete all requirements for RECR training.

The M.Eng. degree is designed as a one-year Master's degree program, but students may extend the duration if required by employment or other circumstances. To complete in one year, students are required to start their degree in the Fall semester, and the typical one-year progression is as follows:

- **Fall semester:** 15 credits of coursework
- **Spring semester:** 15 credits of coursework, including CE 835 (3 credits)
- **Summer semester:** typically 0 credits of coursework

Core course requirements for all M.Eng. Environmental Engineering students are presented in Table 5.1. Specific course offerings and availability vary between academic years.

Advisor/Advanced Degree Course Plan

The general guidance of an M.Eng. degree student is the responsibility of the advisor who will be recommended by the Environmental Engineering area coordinator. The advisor will assist the student in completing a Plan of Study, which should be approved by the student's academic advisor and the Director of Graduate Studies by the end of the first semester, although earlier completion is strongly encouraged. If needed, the Plan of Study may be revised until the end of the add/drop period during the final semester. A recent version of the Master of Engineering Plan of Study form is shown in Figure 5.1. Students should obtain the current fillable pdf version of the form from the CEE Graduate Program Support Coordinator (208 ECoRE Building) or their advisor.

Table 5.1. Core course requirements for the M.Eng. in Environmental Engineering.

Core Courses	Recommended Electives
Take one course in three of the core areas: <i>Biology</i> CE 479 Environmental Microbiology, or CE 473 Ecological Design of Regenerative Aquatic Systems <i>Chemistry</i> CE 570 Environmental Aquatic Chemistry, or CE 573 Environmental Organic Chemistry <i>Chemical Transport</i> CE 574 Reactive Transport Processes in Porous Media, or CE 576 Environmental Transport Processes <i>Process Engineering</i> CE 571 Physical-Chemical Treatment Processes, or CE 572 Biological Treatment Processes	CE 402 Computing Methods for Civil and Environmental Engineering CE 403 Energy Use, Climate Change, and Our Engineered Infrastructure CE 475 Water Quality Chemistry CE 476 Solid and Hazardous Wastes CE 536 (2 cr) Topics in Biogeochemistry CE 556 Environmental Electrochemistry CE 578 Groundwater Remediation CE 591 (1 cr) Environmental Engineering Seminar CE 592 Environmental Engineering and Science Topics
Culminating Experience	
CE 835 Integrated Project Management for Civil Engineers	

Continuous Registration and Satisfactory Scholarship

All requirements for an M.Eng. degree must be met within eight years of the beginning of the first semester of enrollment to the graduate degree program. Applicants admitted to the CEE graduate programs must maintain continuous registration by registering for at least one credit each semester from the date of admission until all degree requirements have been satisfied. Students utilizing the resources of the University (i.e., faculty, facilities, etc.) during the summer must also register for the summer session. M.Eng. students who do not maintain continuous registration will need to complete a “Resume Study/Change of Degree or Major” form and submit the request to the Fox Graduate School Office of Graduate Enrollment Services for approval. Degree requirements are only satisfied when the student has completed the required coursework.

Satisfactory scholarship and acceptable progress toward the M.Eng. degree is required for continuance in the program. One or more failing grades or a cumulative grade-point average below 3.00 for any semester or session (or a combination thereof), may be considered as evidence of failure to maintain satisfactory scholarship.



PennState DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING
Master of Engineering Plan of Study

Student Name _____ PSU ID _____

Student Signature _____ Access ID/PSU e-mail _____

Advisor: _____

Program: _____ Environmental Engineering

_____ Civil Engineering

Area: _____ INFRASTRUCTURE _____ TRANS _____ WATER

COURSE NO	TITLE	Semester to be Taken	Credits	Graduate Course Credits (5xx and 8xx)	CE Course Credits (4xx, 5xx and 8xx)	Area Specialization REQ
CE 835	Integrated Project Management for Civil Engineers	Spring'__	3	3	3	
MEng Program Credits for each Column:			(≥30)	(≥18)	(≥12)	

For students without BS in CEE, list courses required to meet minimum entrance requirements for specialty area

COURSE NO	TITLE	Credits

Draft Plan Approvals (submitted during first semester)

Advisor: _____ Date: _____

Graduate Program Officer: _____ Date: _____

Final Plan Approvals (only if needed--mark up any changes and submit prior to classes for final semester)

Advisor: _____ Date: _____

Graduate Program Officer: _____ Date: _____

Revised: Sept.22

Figure 5.1. Illustration of CE and ENV_E Master of Engineering Plan of Study form.

Master of Engineering Time Schedule

Table 5.2. Schedule of key administrative steps for ENV_E M.Eng. students.

Upon admission:	Confer with the Environmental Engineering area coordinator, who will recommend an advisor.
No later than the end of the first semester:	• Complete new student orientation and CITI RCR online module for partial fulfillment of RECR requirements. • Submit proposed Master of Engineering Plan of Study for approval by the academic advisor and the Director of Graduate Studies.
Second semester of study:	• Complete remaining RECR discussion-hours requirements. • Complete CE 835 culminating experience course.
Final certification:	Students who have completed all of the requirements for the degree will be approved for graduation.

PART 6: MASTER OF SCIENCE REQUIREMENTS

The following policies and procedures have been adopted by the CEE Department to supplement the *Procedures and Regulations* contained in the *Graduate Degree Programs Bulletin* as well as those published on the Fox Graduate School website. These requirements apply to all M.S. degree students in the Environmental Engineering graduate program.

Degree Description and Credit Requirements

The M.S. degree program is strongly oriented towards research. A thesis is required and at least 6 credits of thesis research (CE 600 or 610) must be included in the student's academic course plan. A minimum of 30 graduate credits (400-level and above) are required, of which 20 must be earned at the University Park campus. A minimum of 24 credits of coursework are required, with at least 12 credits of coursework (400 and 500 level) completed within the major (i.e., with CE course prefix). At least 18 credits must be included in the program at the graduate level (500 and 600 level). Students are not permitted to count audited credits toward the minimum credits required for the degree. All students are also required to complete all requirements for RECR training.

A minimum of 6 credits is required in any general studies area outside the research focus area. Coursework taken outside the major program area of emphasis can be used to satisfy the general studies area (also referred to in older documents as an informal minor). The general studies area may be in another program focus area within the CEE Department or may be from another program. As an example of meeting the requirement within the department, an ENV_E student might take two Water Resources Engineering courses to satisfy the requirement. As an example of meeting the requirement outside the department, a student might take two statistics courses. M.S. students may also choose a formal **graduate minor**, which will also satisfy the general studies requirement. A formal minor program must meet the approval of the departments or committees responsible for both the major and minor fields. Completion of a formal graduate minor is not a requirement for the M.S. degree. A list of graduate minors available can be found in the Graduate Bulletin at <https://bulletins.psu.edu/graduate/programs/minors/>

The M.S. thesis should explore new ideas and techniques. Thus, the research topic is expected to investigate as yet unexplored areas of engineering, to extend the knowledge available, and advance the level of understanding of a relevant issue. Emphasis should be placed on the generalization of research findings and overall transferability to engineering problems.

All students entering the M.S. degree in Environmental Engineering must satisfy the core course requirements listed in Table 6.1. Students are also encouraged to take courses outside of the environmental engineering specialty that complement their research activities. Courses in hydrology, geochemistry, agronomy, chemical engineering, chemistry, biotechnology, mineral processing, and materials science are of particular interest.

Table 6.1. Core course requirements for the M.S. in Environmental Engineering. All students must take a minimum of one course associated with each topic area, or take a relevant substitution with approval from their advisory committee.

Topic	Course Options
Biology	CE 479 Environmental Microbiology; or CE 473 Ecological Design of Regenerative Aquatic Systems
Chemistry	CE 570 Environmental Aquatic Chemistry; or CE 573 Environmental Organic Chemistry
Chemical Transport	CE 574 Reactive Transport Processes in Porous Media; or CE 576 Environmental Transport Processes
Process Engineering	CE 571 Physical-Chemical Treatment Processes; CE 572 Biological Treatment Processes; or CE 578 Groundwater Remediation

Academic Advisor/Plan of Study Form

The general guidance of an M.S. degree student is the responsibility of the academic advisor through mutual agreement with the student. The advisor's role is to assist the student in developing a Plan of Study, which should be approved by the student's academic advisor and the Director of Graduate Studies during the first semester of enrollment in the program. If needed, the Plan of Study may be revised until the end of the add/drop period during the final semester. A recent version of the Master of Science Plan of Study is shown in Figure 6-1. Students should obtain the current fillable pdf version of the form from the CEE Graduate Program Support Coordinator (208 ECoRE Building) or their advisor.

Selection of Thesis Supervisor

The academic advisor will normally also serve as the thesis supervisor. However, upon mutual agreement between the academic advisor and the student, another graduate faculty member may be appointed to supervise the student's thesis, preferably before the start of the second semester. The thesis supervisor will recommend coursework supporting the research program, oversee the conduct of the research program, and supervise the development of the master's thesis.



PennState DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING
Master of Science Plan of Study

Student Name _____ PSU ID _____

Student Signature _____ Access ID/PSU e-mail _____

Chair/Thesis Advisor(s): _____

Program: _____ Environmental Engineering

_____ Civil Engineering

Area: ___ WRE ___ GME ___ TRANS ___ SEM

General Studies/Informal Minor Area (Required): _____

Formal Minor (Optional; attach approval/plan from the minor program): _____

COURSE NO	TITLE	Credits	Graduate Credits (5xx and 6xx)	CE Course Credits (4xx, 5xx and 8xx)	General Studies/ Informal Minor Credits	Formal Minor Credits
CE 600	Research	6	6			
MS Program Credits for each Column:		(≥30)	(≥18)	(≥12)	(≥6)	

For students without BS in CEE, list courses required to meet minimum entrance requirements for specialty area

COURSE NO	TITLE	Credits

Draft Plan Approvals (submitted during first semester)

Advisor: _____ Date: _____

Graduate Program Officer: _____ Date: _____

Final Plan Approvals (only if needed--mark up any changes and submit prior to classes for final semester)

Advisor: _____ Date: _____

Graduate Program Officer: _____ Date: _____

Revised: 9/2022

Figure 6.1. Illustration of CE and ENV_E Master of Science Plan of Study form.

Thesis Committee

Every CEE M.S. student must establish a thesis committee, selected in consultation with the student's advisor and approved by the Director of Graduate Studies. The thesis committee consists of a minimum of three members of the graduate faculty, including the student's advisor and thesis supervisor. When appropriate, one of the committee members may be from outside the CEE Department. The student's thesis supervisor chairs the thesis committee. Students must provide the final draft of their thesis to the thesis committee at least two weeks before the scheduled oral thesis defense. The thesis committee is responsible for reviewing the final draft of the thesis prior to the oral examination, and conducting the oral examination of the student.

Final Thesis Defense

Every CEE M.S. degree student must undergo a public oral examination before the thesis committee. The student is responsible for scheduling the examination (date, time, and place). Every effort should be made to schedule the exam such that the student and all thesis committee members can participate in person; an in-person exam is strongly encouraged. However, in rare instances with extenuating circumstances, and with agreement between the student and advisor, the mode for the thesis defense can be hybrid. Students should prepare a notice announcing the defense details and thesis title and provide the notice to the Graduate Program Support Coordinator, who will distribute the notice to all faculty and graduate students.

The student is expected to summarize the research in a presentation that will include:

- (a) a statement of the problem,
- (b) the motivation and justification for the research (i.e., importance of the subject to the profession),
- (c) a statement of research objectives,
- (d) a distinction between the contribution that originates from the student and that which has been taken from other sources,
- (e) a concise presentation of the research methodologies,
- (f) a presentation of key research results,
- (g) interpretation of the results, and
- (h) conclusions that are based on the research findings.

The student should expect to defend the research at the conclusion of the presentation and should be prepared to defend any portion of the thesis. Typically, there will be a period of questioning open to the general public followed by a closed meeting with the thesis committee.

Thesis Submission Requirements

Students must follow the *Thesis and Dissertation Handbook* for the development and formatting of the master's thesis, which can be obtained at: <https://gradschool.psu.edu/academics/theses-and-dissertations>. This publication contains information regarding format, illustrations, etc. Students who have activated their intent to graduate in LionPath must submit a draft of their

thesis (including front matter, back matter and at least 3 chapters) to the Fox Graduate School Office of Theses and Dissertations, through the Electronic Theses and Dissertations (ETD) system, by the published thesis format review deadline for that semester.

The final thesis must meet the approval of the thesis committee as well as the Department Head, in whom the Graduate Faculty of the department has vested the responsibility to ensure that all theses conform to established standards and that the thesis supervisor and thesis committee have fulfilled all obligations with regard to the thesis. In addition, the thesis must be approved by the Fox Graduate School. Students upload the final electronic thesis to the ETD system and pay the thesis submission fee by the published thesis final submission deadline for the semester of graduation. **No changes can be made after this submission, so it is essential that the students have the approval before uploading.** After uploading, the Fox Graduate School will obtain official electronic approvals from committee members and the Department Head. A final copy of the thesis must also be provided to the advisor and committee members as requested upon completion of the program.

Continuous Registration and Satisfactory Scholarship

The M.S. degree is designed to be completed in four semesters, although it is possible to finish sooner. All requirements for an M.S. degree, including acceptance of the final thesis, must be met within eight years of the beginning of the first semester of enrollment to the graduate degree program. Applicants admitted to the Environmental Engineering graduate program must maintain continuous registration by registering for at least one credit each semester from the date of admission until all degree requirements have been satisfied. M.S. students who do not maintain continuous registration will need to complete a “Resume Study/Change of Degree or Major” form and submit the request to the Fox Graduate School Office of Graduate Enrollment Services for approval. Degree requirements have been satisfied when the student has completed the required coursework and the M.S. thesis has been approved by the advisor, the thesis committee, and the Department Head. Students accessing the resources of the University during the summer must also register for the summer session.

Research credits (CE 600 or CE 610) should reflect the time and effort spent in the laboratory, analyzing data, writing the thesis, or other activities specific to the thesis. Although permitted for up to 6 credits for an M.S. degree by the Fox Graduate School, the CEE Department does not assign quality grades for CE 600 or CE 610. Advisors report an “R” (Research) grade for all credits of CE 600 and CE 610.

Satisfactory scholarship and acceptable progress toward the M.S. degree is required for continuance in the program. One or more failing grades or a cumulative grade-point average below 3.00 for any semester or session (or a combination thereof), may be considered as evidence of failure to maintain satisfactory scholarship.

Master of Science Time Schedule

Table 6.2. Schedule of key administrative steps for ENV_E M.S. students.

First semester of study:	• Complete new student orientation and CITI RCR online module for partial fulfillment of RECR requirements. • Submit proposed Master of Science Plan of Study for approval by the academic advisor and the Director of Graduate Studies.
First year of study:	Complete remaining RECR discussion-hours requirements.
During published period:	Activate intent to graduate on LionPATH.
By published thesis format review deadline:	Submit a draft to the Fox Graduate School Office of Theses and Dissertations for format review.
Two weeks prior to the thesis defense:	• Provide a notice of the public defense to the Graduate Program Support Coordinator for distribution to faculty and graduate students. • Provide a copy of the final thesis draft to each thesis committee member.
Not less than two weeks following submission of the final draft to the committee:	Oral examination (thesis defense).
By published thesis final submission deadline:	• Obtain final approval of thesis committee members (typically after revisions) <i>before</i> submission to Thesis Office. • Submit final, corrected, electronic copy of thesis to the ETD system. No changes can be made after this submission. • Provide final thesis copies to the thesis advisor and committee members as requested.
Final certification:	Students who have completed all of the requirements for the degree will be approved for graduation.

PART 7: DOCTORAL REQUIREMENTS

The following policies and procedures have been adopted by the CEE Department to supplement the *Procedures and Regulations* contained in the *Graduate Degree Programs Bulletin* as well as those published on the Fox Graduate School website. These requirements apply to all Ph.D. degree students in the Environmental Engineering program.

Degree Description and Credit Requirements

The Ph.D. is the highest degree offered by the Department and is designed to conduct the most advanced research in an area of specialization. A dissertation is required. All students in the Direct Entry program (i.e., without first completing an M.Eng. or M.S. degree) should satisfy all core course requirements for environmental engineering (Table 6.1). Students are not permitted to count audited credits toward the minimum credits required. All students are required to complete all requirements for RECR training. Prior to completion of the Ph.D. program, the student must spend at least two consecutive semesters as a registered full-time student to satisfy the Fox Graduate School residency requirement.

The CEE Ph.D. degree programs are normally completed in four years by full-time students. However, time to complete the degree varies depending on individual effort and success in research and writing. The doctoral degree program typically consists of six stages: 1) core coursework; 2) coursework related to an area of specialization; 3) qualifying and English competency examinations; 4) naming of the doctoral committee and the comprehensive examination; 5) research activities; and 6) writing and defending the doctoral dissertation.

All CEE Ph.D. students should develop a draft Plan of Study in consultation with their advisor during their first semester; the draft plan should be submitted to the CEE Director of Graduate Studies for review and preliminary approval. A recent Plan of Study form is shown in Figure 7.1. Students should obtain the current fillable pdf version of the form from the CEE Graduate Program Support Coordinator (208 ECoRE Building) or their advisor.

In Environmental Engineering, Ph.D. students are suggested to take a minimum of 15 credits of graduate course work (400 level and above) beyond the Master's degree. For Ph.D. students who completed a Master's degree in Environmental Engineering at Penn State, a minimum of 12 credits of graduate course work (400 level and above) is suggested. For those in the Direct Entry program, a minimum of 30 total credits of graduate coursework is suggested beyond the B.S. For all Ph.D. students, the final course requirements are finalized and approved by the qualifying exam committee after the oral exam is passed, and reflected in the final Plan of Study.



PennState DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

PhD Plan of Study (see requirements on back of form)

Student Name _____ PSU ID _____

PSU e-mail _____ Chair/Advisor(s): _____

Draft Plan of Study; Date Submitted: _____ Date Plan Approved by Qualifying Exam Committee _____

Program: _____ Environmental Engineering

_____ Civil Engineering

Area: _____ WRE _____ GME _____ TRANS _____ SEM

Prior Degrees: _____ BS in _____ MS in _____ MS at PSU? Yes _____ No _____

PhD Formal Minor (Optional; attach approval/plan from the minor program): _____

PhD Dual Title (If applicable, attach approvals and forms): _____

Course	Title	Credits
Courses Required to Meet Minimum Entrance Requirements (if applicable; do not count towards PhD credits)		
Planned Courses to Meet PhD Requirements (see back of form)		
Total Coursework for PhD Requirements (see back for minimums required and suggested):		

Draft Plan Approvals (submitted during first semester):

Advisor: _____ Date: _____

Graduate Program Officer: _____ Date: _____

Final Plan Approved by Qualifying Exam Committee (submitted within 30 days of Qualifying Exam):

Committee Chair: _____ Date: _____

Graduate Program Officer: _____ Date: _____

Updated 12/13/2019

Figure 7.1. Illustration of CE and ENV_E Ph.D. Plan of Study form.

Dual-Title Ph.D. in Biogeochemistry

The ENV_E graduate program offers a dual-title Ph.D. degree in Biogeochemistry. Potentially interested students are directed to the Graduate Bulletin listings for this program, which provides information on admissions requirements, degree requirements, and courses. They should also discuss this possibility with their advisor, as it directly impacts the specifics of the Plan of Study.

Biogeochemistry dual-title program:

<https://bulletins.psu.edu/graduate/programs/majors/biogeochemistry/>

Qualifying Examinations

Official status as a doctoral student is granted when the qualifying examination has been passed. The qualifying examination serves four purposes: 1) to determine the compatibility between the student's academic and professional aspirations and the graduate program goals; 2) to assess the student's competence; 3) to confirm that the student should continue in the ENV_E Ph.D. program; and, 4) to finalize and approve the Ph.D. Plan of Study form. If the student is pursuing an approved dual-title graduate degree, the dual-title field must be integrated into the qualifying examination of the student's major program (i.e., a single qualifying examination is administered, which incorporates both the graduate major field and the dual-title field).

The qualifying examinations should be taken after the second semester of study, and it must be taken within three semesters (excluding summer sessions) of entry into the doctoral program. To be eligible for the qualifying examination, the student must meet the following criteria:

- have a minimum grade-point average of 3.00 at the time the examination is given, for graduate work done at Penn State.
- have no deferred grades, missing grades, or exceed 12 quality graded research credits.
- have completed at least 18 credits beyond the bachelor of science.
- be registered during the semester the examinations are administered, *excluding* summer (summer is excluded only if the student was registered the preceding spring semester).

The primary purpose of the exam is to assess the student's capabilities in areas critical to completion of a dissertation, including verbal and written communication, critical thinking, knowledge of relevant graduate course material and the field of Environmental Engineering, and ability to conduct research. To assess this, a committee of three to four graduate faculty members, the majority of whom must be in Environmental Engineering, will evaluate the student in four areas related to coursework and research using the following:

- The student's grade-point average (GPA) in 400- and 500-level courses in CE taken since the student started the graduate program. *The student is responsible for bringing a copy of their transcript to the oral qualifying exam.*
- The student's research progress to date, as evaluated by their advisor. At the end of each semester prior to taking qualifying exam, the advisor should evaluate the student's progress in research as: *below expectations, meets expectations, exceeds expectations.*

This evaluation serves no purpose other than to evaluate the student's progress in the qualifying exam. If the advisor rates the student's progress as *below expectations*, the advisor is expected to clarify what improvements are needed.

- The student's performance on the written exam (explained below).
- The student's performance in the oral exam (explained below).

Written Qualifying Examination

The student must pass the written qualifying exam prior to taking the oral exam. The written exam and oral exams must be scheduled prior to taking the written exam, as explained in the Scheduling section below. The written exam will consist of three one-hour exams, and the student must receive a score of at least 80/100 on each exam. (Note: if a student is pursuing a dual-title degree, that field must also be included in the qualifying exam.) The first two exams will cover material taken from graduate-level CE courses or CE 479 (Microbiology). The student must select a *Primary Strength* course and a *Secondary Strength* course as the topics of the first two exams. They can be selected from any of the following courses, and must be from distinct areas of the core curriculum:

- CE 479: Environmental Microbiology for Engineers
- CE 556: Environmental Electrochemistry
- CE 570: Environmental Aquatic Chemistry
- CE 571: Physical-Chemical Treatment Processes
- CE 572: Biological Treatment Processes
- CE 573: Environmental Organic Chemistry
- CE 574: Reactive Transport Processes in Porous Media
- CE 576: Environmental Transport Processes
- CE 578: Groundwater Remediation

Students may petition to cover a course outside this list (e.g., a CE 597 course) to their committee.

The third exam is the English examination. This exam consists of a student response in the form of a concisely written essay on a topic selected by the committee. The examination is evaluated based on effective communication in English, including syntax, grammar, spelling, and organization (a graduate school requirement), and comprehension and articulation of contemporary topics relevant to Environmental Engineering. If the student is unable to meet committee expectations for written English, one appeal for re-examination may be honored at the discretion of the qualifying exam committee. Students who fail the written English examination must complete an English writing course, such as ENGL 202C (Effective Writing: Technical Writing). International students may schedule ESL 116G (ESL Composition for Academic Disciplines). A grade of "B" or better must be achieved for the student to satisfy the written English requirement. Students are permitted to complete remedial English writing courses a maximum of two times.

The student must successfully pass the written qualifying exam in order to continue to the oral qualifying examination.

Oral Qualifying Examination

The Oral Exam should be taken within one month, typically within one to two weeks, after the Written Exam. The oral qualifying examination consists of a short oral presentation by the student followed by committee questions related to the presentation and the written qualifying examination. The oral qualifying examination will normally be 90 minutes in length. The oral presentation duration is normally 20-30 minutes. The topic of the presentation is the progress the student has made on their research project since beginning at Penn State. Committee evaluation of the presentation is conducted on the basis of effective communication in English (a graduate school requirement), technical quality of the presentation, the amount of progress made on their research project, and the quality of the research (department requirements). The oral examination will continue with committee questions on the subject of the oral presentation. The primary focus of committee questions following the oral examination will be on the subject material of the research presentation and the written qualifying examination.

The qualifying exam committee may require students to enroll in ESL 114G (American Oral English for Academic Purposes) to improve speaking competency and achieve a grade of “B” or better. Students may take remedial speaking courses a maximum of two times to meet this requirement.

Scheduling and Timeline

When the student is ready to take the Qualifying Exam, they should:

- Formally request to take the Qualifying Exam via email to the Environmental Area Coordinator *at least 3 weeks prior to the scheduled exam*.
- Select their *Primary Strength* and *Secondary Strength* topics for the Exam. These topics should be relevant to the student’s research project.
- Select a committee with their advisor consisting of at least three members of the Graduate Faculty, the majority of whom should be from Environmental Engineering. The committee members should include those who taught the courses that the student is selecting for the exam, if possible.
- The Written Exam will be scheduled by the Environmental Area Coordinator with input from the students.
- The student is responsible for scheduling the Oral Exam with their committee prior to taking the Written Exam. The student is responsible for organizing a room reservation for a 2-hour period.
- When the student takes the oral exam, they should bring a copy of their transcript at Penn State containing their course grades.

Qualifying Examination Results

The qualifying exam committee will meet to formulate a final decision after the oral qualifying examination. A favorable vote of at least two-thirds of the committee is required for passing both the oral and written components of the English and qualifying examinations. The committee may require the student to schedule courses to remediate academic and language deficiencies that were discovered during the qualifying examinations. Immediately following the qualifying exam committee meeting, the committee will meet with the student to discuss the results. The results will take the form of one of the following:

- Qualify the student to continue for the Ph.D. degree. From this point on the student will take the coursework outlined in the Ph.D. Plan of Study as amended by the qualifying exam committee and begin preparing for the comprehensive examination. This is the date set to begin the eight-year time limitation to complete the Ph.D. degree.
- Postpone a qualifying decision until further conditions are met. These conditions may include additional technical coursework or remedial writing or speaking coursework as described under the written English and oral qualifying examinations above. The qualifying exam committee will set forth all further conditions in writing to the student and file them with the Graduate Program Support Coordinator.
- Do not qualify the student to continue for the Ph.D. If this option is selected, alternative steps that may help the student achieve her/his academic and professional goals will be discussed prior to adjournment. If the student fails the oral qualifying examination, one appeal for re-examination may be honored at the discretion of the qualifying exam committee. The qualifying exam committee will document the outcome in writing to the student and send it to the Graduate Program Support Coordinator, who files it with the Fox Graduate School.

The chair of the qualifying exam committee shall forward the decisions, using the departmental evaluation form and the Graduate School “Report on Doctoral Qualifying Examination” form to the Graduate Program Support Coordinator, 208 ECoRE Building, who will submit the examination results to the Fox Graduate School for approval and recording. The student becomes an official doctoral student only when positive qualifying examination results are recorded by the Fox Graduate School.

Doctoral Committee

This stage begins with the formation of a doctoral committee and culminates with a comprehensive examination. Following successful completion of the qualifying examinations and formation of the doctoral committee, the student conducts an in-depth exploration of a chosen area of study. During this stage, the student sharpens the subject and focus of the research undertaking, and develops theoretical frameworks/perspectives, and research methods and techniques suitable for studying a wide range of problems associated with the area of specialization. This is a highly individualized phase with students pursuing interests that are

representative of faculty expertise, of the broader field of engineering, and with the potential for original contribution to the scientific area of inquiry.

The student should carefully select a doctoral committee as soon as possible, but no more than one calendar year after successfully completing the qualifying examinations and at least two weeks prior to the comprehensive exam. Doctoral committee members should bring different but complementary strengths to the student's research program. The student is advised to choose individuals who can provide expertise in the chosen area(s) of specialization, the general field of engineering, and the research methods specific to the dissertation. The student and their academic advisor should notify the Graduate Program Support Coordinator of the recommended committee membership and the role of each member. After approval of the recommended committee from the Director of Graduate Studies, the Graduate Program Support Coordinator will prepare and circulate the Research Doctoral Committee Appointment Form for signatures and will submit the student's doctoral committee appointment form to the Fox Graduate School. Upon approval of the doctoral committee by the Fox Graduate School, the committee will be recorded.

Establishing the Doctoral Committee

The doctoral committee consists of four or more active members of the Graduate Faculty. In addition, the doctoral committee satisfies the following guidelines:

- At least two members are from the CE Program; at least one is from the campus at which the student is enrolled
- The dissertation advisor usually serves as chair
- If the student is also pursuing a dual-title field of study, a co-chair representing the dual-title field must be appointed
- At least one member must represent a field outside the student's major field of study. This member is referred to as the "Outside Field Member." A dual-title representative may serve as the Outside Field Member.
- At least one member must be in an administrative unit outside the CEE Department. This member is referred to as the "Outside Unit Member."
- If applicable, the "Outside Field Member" and the "Outside Unit Member" may be one person.
- If the student has a minor, that field must be represented on the committee by a "Minor Field Member."

Additional specific doctoral committee composition requirements are presented in the *Graduate Degree Programs Bulletin*.

Committee Responsibilities

The appointment of a doctoral committee constitutes a major shift in program orientation, requiring the student to consult regularly with at least three additional faculty advisors. The doctoral committee approves the graduate study plan, periodically reviews academic progress,

advises the student on their area of specialization, guides the student's dissertation research, prepares and administers the comprehensive and final oral examination (the dissertation defense), and evaluates the student's doctoral dissertation. Continuing communication between the student and their doctoral committee members is strongly recommended so as to allow a mentoring process to develop and to preclude misunderstandings during the final stages of study.

The doctoral committee is also responsible for conducting annual evaluations of the doctoral student. It is recommended that these evaluations be performed via a meeting of the entire committee (physical or virtual presence), although asynchronous meetings with individual members may suffice, if necessary for scheduling purposes. These meetings must be separate from the comprehensive examination. The annual evaluations must be signed by all committee members and submitted to the CEE Director of Graduate Studies. The annual meetings should commence within one year of the qualifying exam. For consistency and monitoring, it is requested that the annual reviews be conducted and submitted in March or April each year, beginning with the spring semester following qualifying exam completion.

Dissertation Advisor

The student must designate a dissertation advisor; normally the doctoral committee chair or co-chair serve as dissertation advisor(s). The dissertation advisor directs the student's dissertation research. As such, they must specialize in the area of the chosen dissertation.

Replacing Committee Members

A student may replace any or all members of the doctoral committee. To make committee changes, the student must send the requested changes to the Graduate Program Support Coordinator, who will complete a revised *Research Doctoral Committee Appointment Signature Form*, have it signed by the new committee member(s) and the Director of Graduate Studies, and submit it to the Fox Graduate School. Either the student or the incumbent (committee member) may suggest a replacement, however, all affected parties should meet and agree prior to formal action. The student must consult with her/his committee chair before replacing a committee member; the consensus of any removed members should be indicated by the chair.

It is the responsibility of the Director of Graduate Studies to periodically review the membership of doctoral committees to ensure that its members continue to qualify for service on the committee in their designated roles. For example, if budgetary appointments or employment at the University have changed since initial appointment to the committee, then changes to the committee membership may be necessary.

Dissertation Proposal and Comprehensive Examination

A formal, written proposal detailing the proposed doctoral research must be developed independently by the student. It documents a personalized plan for conducting the study and serves as a contract between the student and the doctoral committee regarding expectations for the ensuing research. Led by the dissertation advisor, the doctoral committee supervises the

development of the student's proposal, conducts the proposal hearing, and approves the proposal. Regular consultation with committee members is strongly encouraged. The research proposal must be submitted to the doctoral committee at least two weeks prior to the Oral Comprehensive Examination.

The dissertation proposal should be of the same nature and quality as what would typically be submitted to a funding agency such as the National Science Foundation (NSF). It should define a significant problem, review the current literature, provide a critical analysis of the state-of-the-art, identify key knowledge or methodological gaps directly related to the student's thesis, and outline important research questions along with 3-4 hypotheses. The proposal should also describe methods of investigation and contribute some significant new information, data, or preliminary results. It is recommended that the dissertation proposal adhere to the guidelines provided for research proposals submitted to the NSF, including defined sections for Intellectual Merit and Broader Impacts. The proposal should contain a section titled "Detailed Research Plan," where the research plan for the dissertation is described with sufficient depth and breadth.

The proposal should follow the length limits of an NSF proposal: 15 pages of single-spaced text in a reasonable font size, including embedded figures, with 1" margins. Cited references should appear at the end of the proposal and do not count toward the page limit. The length limit may be extended with permission from the Ph.D. advisor. If material has been submitted for publication or published, that material may be included as an appendix.

The purpose of the oral comprehensive examination is to evaluate the student's competence and potential for conducting independent research. The student is expected to demonstrate competence consistent with the student's intended dissertation research. The student is encouraged to discuss with individual doctoral committee members the material upon which the student will be examined. The Graduate Program Support Coordinator must be notified of the date, time, and location of the oral comprehensive examination at least one month in advance so that Fox Graduate School notification and approval can be completed; difficulties in approval sometimes arise and must be resolved at least two weeks prior to the examination.

The student will orally present and defend the research proposal as part of the oral comprehensive examination. The oral defense will consist of a 30-minute presentation by the candidate on the highlights of their work, followed by questions from the Doctoral Committee. The research proposal will be evaluated by the doctoral committee based on technical merit and other criteria deemed critical to the research by the doctoral committee. Approval of the proposal must have at least two-thirds favorable vote from the committee.

To be eligible for the comprehensive examination, the student must meet the following criteria:

- complete all core courses, and other requirements as determined by the doctoral committee;
- achieve a minimum graduate coursework grade-point average of 3.00;
- have no deferred or missing grades;
- satisfy the English Competence requirement; and

- be registered as a full-time or part-time student for the semester in which the examination is taken.

Upon successful completion of the comprehensive examination, students are formally admitted to candidacy for the Ph.D.

Continuous Registration and Satisfactory Scholarship

Ph.D. students must maintain continuous registration (normally excepting summers, unless the comprehensive exam or final oral exam are taken in the summer) from the date of admission until all degree requirements have been satisfied. Students who do not maintain continuous registration may be dropped from the program and must apply for a resumption of study.

Research credits (CE 600 or CE 610) should reflect the time and effort spent in the laboratory, analyzing data, writing the dissertation, or other activities specific to the dissertation. Although permitted for up to 12 credits for Ph.D. students by the Graduate School, the CEE Department does not assign quality grades for CE 600 or CE 610. Advisors report an “R” (Research) grade for all credits of CE 600 and CE 610.

Students who have passed the oral comprehensive examination can maintain continuous registration by registering for credits in the usual manner or by enrolling for noncredit CE 601 (full-time thesis preparation) or 611 (part-time thesis preparation).

Satisfactory scholarship and acceptable progress toward the doctoral degree is required for continuance in the program. One or more failing grades or a cumulative grade-point average below 3.00 for any semester or session (or a combination thereof), may be considered as evidence of failure to maintain satisfactory scholarship.

Conducting Research

Conducting research and writing a dissertation typically takes between two and three full years depending on the candidate’s expertise and efforts, and the types of research methods employed. The candidate must accomplish the research according to the plan set forth in the proposal as presented to the doctoral committee. While conducting the research, the candidate will be in regular communication with her/his dissertation advisor and doctoral committee members. Major changes require approval of the doctoral committee.

Writing and Defending the Doctoral Dissertation

Writing Final Dissertation Draft

The dissertation advisor will ensure that the final draft includes all appropriate sections, is prepared according to an acceptable style, and is ready to be submitted to the doctoral committee. The candidate is responsible for the content and style, and must follow the rules and deadlines of the Fox Graduate School concerning dissertation preparation, which are detailed in

the *Thesis and Dissertation Handbook* at: <https://gradschool.psu.edu/academics/theses-and-dissertations>. Students who have activated their intent to graduate in LionPath must submit a draft of their dissertation (including front matter, back matter, and at least 3 chapters) to the Fox Graduate School Office of Theses and Dissertations, through the ETD system, by the published dissertation format review deadline for that semester.

Both the dissertation advisor and the candidate are responsible for ensuring the completion of a draft of the dissertation and for adequate consultation with members of the dissertation committee well in advance of the oral examination. Major revisions to the dissertation must be completed before the final oral examination. The dissertation should be in its final draft, with content, bibliography, tables, etc. correct and polished and distributed to the committee at least two weeks prior to the oral examination.

Final Oral Examination Dissertation Defense

The final oral examination for CEE doctoral students is a public, oral examination administered and evaluated by the candidate's entire doctoral committee. The meeting is chaired by the student's doctoral committee chair. The final oral examination will consist of an oral presentation of the doctoral candidate's dissertation and a public period of questions and candidate responses. Questions will normally relate directly to the dissertation, but may cover the candidate's entire plan of study because the major purpose of the examination is also to assess the student's general scholarly attainments. The portion of the examination in which the dissertation is presented is open to the public.

The length of the final oral examination is normally 2 to 3 hours and may be scheduled any time during the semester. However, the examination may not be scheduled until at least 90 days have elapsed after the comprehensive examination was passed, and students should be mindful of the Fox Graduate School deadline for passing the doctoral defense to allow graduation in a given semester. Every effort should be made to schedule the exam such that the student and all dissertation committee members can participate in person; an in-person exam is strongly encouraged. However, in rare instances with extenuating circumstances, and with agreement between the student and advisor, the mode for the final oral examination can be hybrid. The examination is officially scheduled by the Office of Graduate Enrollment Services, on the recommendation of the Director of Graduate Studies of the CEE program. The doctoral candidate must email a formal request for the final oral examination (date, time, and location) to the CEE Graduate Program Support Coordinator at least one month prior to the scheduled examination to allow Fox Graduate School approval at least two weeks in advance. Students should also prepare a notice announcing the defense details and dissertation title and provide the notice to the Graduate Program Support Coordinator, who will distribute the notice to all faculty and graduate students.

To schedule the final oral examination the candidate must:

- be registered and in good standing for the semester in which the final oral examination is taken;

- ensure that at least 90 days have elapsed between passing the comprehensive examination and the proposed final oral examination date;
- satisfy all other requirements for the degree;
- gain dissertation advisor approval of the dissertation draft;
- negotiate, with all doctoral committee members, a final oral examination date;
- notify the Graduate Program Support Coordinator at least one month prior to the proposed examination date; and
- Additional Fox Graduate School requirements for the conduct of the final oral examination are presented at: <https://bulletins.psu.edu/graduate/>.

Immediately following the oral examination the doctoral committee will meet to formally evaluate the candidate's work and cast votes. A favorable vote of at least two-thirds of the members of the committee is required to pass the final oral examination. If the student fails, it is the responsibility of the doctoral committee to determine whether a second final oral examination will be granted. A candidate may not be allowed more than two attempts at the final oral examination. The committee members will each record the results and rating in LionPath.

Final Dissertation Document

After passing the final oral examination, doctoral candidates must make the necessary corrections or revisions suggested by the committee members and prepare the dissertation in final form. Candidates must allow sufficient time to make revisions in order to meet the dissertation submission deadline of the Fox Graduate School.

The final dissertation must meet the approval of the Department Head, in whom the Graduate Faculty of the department has vested the responsibility to ensure that all dissertations conform to established standards and that the dissertation advisor and doctoral committee have fulfilled all obligations with regard to the dissertation. In addition, the dissertation must be approved by the Fox Graduate School.

Students upload the final electronic dissertation and pay the dissertation submission fee through the ETD system by the published dissertation final submission deadline. **No changes can be made after this submission, so it is essential that the students have the approval before uploading.** After uploading, the Fox Graduate School will obtain official electronic approvals from committee members and the Department Head through LionPath. A final copy of the dissertation must also be provided to the advisor and committee members as requested upon completion of the program. It has been historically customary for the student to present a library-bound copy to the dissertation advisor and committee members; however, many faculty members may prefer a final electronic file.

Milestones, Deadlines, and Paperwork Required for CEE Ph.D. Programs

A summary of the key milestones, deadlines, and paperwork requirements is provided in Table 7.1. It is also important to note that:

- The student has primary responsibility for all requirements and deadlines.
- All forms **MUST** be completed through the CEE Graduate Program Support Coordinator in 208 ECoRE Building.
- The Comprehensive and Final Oral exams must first be approved by the Graduate School **before** the exam is held.
- Semester counts cited in the table below do not include summer terms.
- Failure to meet deadlines may have financial and completion date consequences beyond the control of the department.

Table 7.1. Schedule of key milestones, deadlines and paperwork required for CEE Ph.D. programs.

	WHEN	WHAT	OVERVIEW
YEAR ONE	By Nov 1 (April 1) of First Semester	Submit Signed Draft Plan of Study	Developed in consultation with adviser. Submit to the CEE Director of Graduate Studies with adviser signature.
	By End of First Semester	RECR Exam and Discussion Hours	Must complete the new student orientation and online CITI RCR module for partial fulfillment of RECR requirements..
	By End of Second Semester <i>and</i> At least 18 credits completed beyond the BS degree	Schedule and Take Qualifying Exam Must have: • Minimum GPA of 3.0 • No deferred or missing grades • Be registered at the time of the exam (<i>except summer if reg for spring</i>)	• Complete remaining RECR discussion-hours requirements. • The Report on the Doctoral Qualifying Exam is sent to the CEE Graduate Program Support Coordinator, who sends to the Fox Graduate School after the exam. The Report includes the Written English, Oral English, Written Technical , and Oral Technical exam results.
YEAR TWO	By End of Third Semester	Pass all portions of the Qualifying Exam Submit Signed and Approved Final Plan of Study	The qualifying exam committee (including advisor and area faculty) also reviews the student's transcripts and approves a Final Plan of Study that is submitted to the CEE Director of Graduate Studies with the Report on the Doctoral Qualifying Exam. The final Plan of Study may be modified in future semesters, if needed.

	WHEN	WHAT	OVERVIEW
	By End of Fourth Semester <i>and</i> At least One Month before the Comprehensive Exam	Form the Doctoral Committee	The Research Doctoral Committee Appointment Form will be prepared by the CEE Graduate Program Support Coordinator upon request of the student. The form must be signed by all committee members and the Director of Graduate Studies. The form is then submitted to the Graduate School for approval. The doctoral committee may be modified in future semesters, if needed.
INTERMEDIATE YEARS	Annually by May 30	Meet with the Doctoral Committee for annual review of progress	According to GCAC-603, Ph.D. students should have an annual review of progress conducted by the doctoral committee. These meetings are <i>in addition</i> to any meetings for exams and may include remote participation by some committee members. A copy of the completed evaluation should be submitted to the CEE Director of Graduate Studies by May 30 each year.
	One month prior to the Comprehensive Exam date	Request the Comprehensive Exam Must have: • Minimum GPA of 3.0 • No deferred or missing grades • Be registered at the time of the exam	The comprehensive exam date must be approved by the Fox Graduate School an absolute minimum of two weeks before the exam date. To allow time for signatures and adjustments, the comprehensive examination must be requested from the CEE Graduate Program Support Coordinator at least one month prior to the exam date. Upon passing this exam, the student is officially a Ph.D. Candidate.
	Two weeks prior Comprehensive Exam	Submit Research Proposal to the doctoral committee	
FINAL SEMESTER	Beginning of Last Semester	File Intent to Graduate	Complete in LionPath
	By 2 nd week of Last Semester	Update Plan of Study and Committee	Check that paperwork has been completed for any changes in coursework, including minors or certificates. Make sure form is submitted and approved for any changes or additions to the doctoral committee.
	Early in the final semester	Submit Draft Thesis to Fox Graduate School for format review	Exact deadline set each semester by the Fox Graduate School. This step must be taken by the deadline or removal from the graduate list is executed.

	WHEN	WHAT	OVERVIEW
	One month prior to the Final Oral Exam (Defense) At least 90 days between the Comprehensive Exam and the Final Oral Exam	Request the Final Oral Exam	The final oral exam date must be approved by the Fox Graduate School an absolute minimum of two weeks before the exam date. To allow time for signatures and adjustments, the Final Oral Examination requested from the Graduate Program Support Coordinator at least one month prior to the exam date.
	Two weeks prior to the Final Oral Exam (Defense)	Submit Final Draft Thesis to Graduate Committee	
	About a month before the end of the final semester	Submit final thesis to the Fox Graduate School	Allow time to obtain approval before submission; no changes can be made after submission. Formal approvals are electronic. Exact deadline set each semester by the Fox Graduate School.