DOCTOR OF PHILOSOPHY (PHD) DEGREE IN THE FIELD OF CIVIL AND ENVIRONMENTAL ENGINEERING

Program Learning Outcomes for the PhD Degree in the field of Civil and Environmental Engineering

Upon completing the PhD degree in the field of Civil and Environmental Engineering, students will be able to:

1. Demonstrate a solid foundation in civil and environmental engineering at the graduate level.
2. Acquire advanced knowledge of the principles of civil and environmental engineering and apply them to advanced technical problems.
3. Conduct an independent research program.
4. Demonstrate professional written and oral communication skills.

Requirements for the PhD Degree in the field of Civil and Environmental Engineering

For general university requirements, please see Doctoral Degrees (https://ga.rice.edu/graduate-students/academic-policies-procedures/regulations-procedures-doctoral-degrees/). For additional requirements, regulations, and procedures for all graduate programs, please see All Graduate Students (https://ga.rice.edu/graduate-students/academic-policies-procedures/regulations-procedures-all-degrees/). Students pursuing the PhD degree in the field of Environmental Engineering must:

- Complete 90 credit hours at the 500-level and above of approved courses past the BS degree (60 credit hours past the MS degree) with high standing (see guidelines on the department website (https://cee.rice.edu/)).
- Complete at least 6 core courses required by the department with a minimum GPA of 3.00 or higher and a minimum grade of B- (2.67 grade points) in each course.
- Spend at least four semesters in full time study at Rice and successfully accomplish the following:
  - Pass a preliminary examination in environmental engineering (see guidelines on the *PhD Program > Preliminary Exam* tab of the department website (https://cee.rice.edu/academics/graduate-programs/phd-program/phd-preliminary-exam/)).
  - Pass a qualifying examination on coursework, proposed research, and related topics.
  - Complete a thesis indicating an ability to conduct original and scholarly research.
  - Pass a formal public oral examination on the thesis and related topics.

Course requirements are stipulated to prepare and train students for rigorous and high-quality education, research, and practice. These courses, usually completed within the first two years of graduate school, are designed to train and test the student's aptitude for higher-level thinking, problem-solving, and independent research. Core courses also contribute breadth beyond minimum competency as civil and environmental engineers. The students are expected to strive for breadth and depth in core course selection, by working with their advisor and preliminary examination committee, and ensure that minimum core competency expectations are met. Reasonable replacements to core courses from CIVI and ENVI fields of study will be considered and permitted by the CEE graduate committee when requested by the student with approval of advisor. For example, students may choose core courses from across the fields of study when it strengthens their degree program.

PhD students will be scheduled to take their preliminary examination no later than after two semesters of coursework at Rice. A student who enters in the spring semester needs to take the preliminary exam in the following spring semester along with other students. A student who passes the written and oral parts of the preliminary exam becomes eligible for taking the qualifying exam.

The qualifying examination is administered by the doctoral committee after students develop a research proposal to demonstrate their preparation for the proposed research and identify any areas requiring additional coursework or study. As part of the advanced degree training, we also may require students to assist the faculty in undergraduate courses and laboratory instructions.

The requirements listed in the General Announcements (GA) satisfy the minimum requirements for this degree program. In certain instances, courses (or requirements) not officially listed here may be substituted upon approval of the program's academic advisor or, where applicable, the department or program's Director of Graduate Studies. Course substitutions or any exceptions to the stated official curricular requirements must be approved by the Office of Graduate and Postdoctoral Studies (https://graduate.rice.edu/). Students and their academic advisors should identify and clearly document the courses to be taken.

Summary

Code	Title	Credit Hours
Total Credit Hours Required for the PhD Degree in the field of Civil and Environmental Engineering		90

Degree Requirements

Code	Title	Credit Hours
Core Requirements [1, 2]		
Select 6 courses from the following:		*18*
CEVE 500 / MECH 500	ADVANCED MECHANICS OF MATERIALS	
CEVE 501	CHEMISTRY FOR ENVIRONMENTAL ENGINEERING AND SCIENCE	
CEVE 503 / MECH 520	NONLINEAR FINITE ELEMENT ANALYSIS	
CEVE 504	ATOMSPHERIC PARTICULATE MATTER	
CEVE 509	HYDROLOGY AND WATER RESOURCES ENGINEERING	

CEVE 511	ATMOSPHERIC CHEMISTRY AND CLIMATE
CEVE 514	COASTAL HAZARDS IN A CHANGING CLIMATE
CEVE 518	ENVIRONMENTAL HYDROGEOLOGY
CEVE 524	TIME-DEPENDENT SYSTEM RELIABILITY METHODS AND APPLICATIONS
CEVE 525	SUSTAINABLE INFRASTRUCTURE MATERIALS
CEVE 527 / MECH 527	PHYSICS GUIDED MACHINE LEARNING & DATA DRIVEN MODELING FEM
CEVE 531	DESIGN AND BEHAVIOR OF CONCRETE BUILDINGS AND BUILDING ELEMENTS
CEVE 534	FATE AND TRANSPORT OF CONTAMINANTS IN THE ENVIRONMENT
CEVE 535	PHYSICAL CHEMICAL PROCESSES FOR WATER QUALITY CONTROL
CEVE 536	ENVIRONMENTAL BIOTECHNOLOGY AND BIOREMEDIATION
CEVE 539	ADVANCED STRUCTURAL ANALYSIS
CEVE 541	DESIGN AND BEHAVIOR OF STRUCTURAL STEEL BUILDINGS AND BUILDING ELEMENTS
CEVE 543	STATISTICAL-PHYSICAL METHODS FOR HYDROCLIMATE EXTREMES AND CATASTROPHES
CEVE 544	ENVIRONMENTAL MICROBIOLOGY AND MICROBIAL ECOLOGY
CEVE 545	ORIGAMI ENGINEERING
CEVE 550	ENVIRONMENTAL ORGANIC CHEMISTRY
CEVE 560	BRIDGE ENGINEERING AND EXTREME EVENTS
CEVE 562	INFRASTRUCTURE RESILIENCE TO MULTIPLE HAZARDS
CEVE 576 / MECH 576	STRUCTURAL DYNAMIC SYSTEMS
CEVE 578	EARTHQUAKE ENGINEERING
CEVE 592	MODELING AND ANALYSIS OF NETWORKED SYSTEMS
CEVE 596 / MECH 566	SYSTEM IDENTIFICATION OF DYNAMIC SYSTEMS WITH MACHINE LEARNING
CEVE 678 / MECH 678	APPLIED STOCHASTIC MECHANICS
CEVE 679 / MECH 679	APPLIED MONTE CARLO ANALYSIS
Additional Coursework as Approved by the Department	**72**
Total Credit Hours	**90**

Footnotes and Additional Information

[1] Substitutions will be considered when a Core Requirement is not offered, or under special circumstances related to the professional goals of the student. Substitutions will be considered on a case-by-case basis, and will require approval by the faculty. CEVE 520 is a potential substitute course.

[2] Students should consult with their advisor and committee to select 6 courses (18 credit hours) from the Core Requirements in an Area of Specialization most relevant to their pursuits. See course lists below.

Course Lists to Satisfy Requirements

Areas of Specialization

Students should consult with their advisor and committee to select 6 courses (18 credit hours) in an Area of Specialization most relevant to their pursuits. Students may select one of the following typically approved Areas of Specialization or from a student-designed Area of Specialization in consultation with the advisor and committee. The 6 courses (18 credit hours) can be chosen from the Core Requirements or from Department Approved Area of Specialization.

Please Note: Course offerings may vary from year to year. Course substitutions will be considered when a Core Requirement is not offered, or under special circumstances related to the professional goals of the student. Substitutions will be considered on a case-by-case basis, and will require approval by the faculty advisor and the Graduate Studies Committee.

Area of Specialization: Climate, Energy, and the Environment

Code	Title	Credit Hours
Core Requirements		
Select up to 6 courses from the following:		*6-18*
CEVE 504	ATOMSPHERIC PARTICULATE MATTER	
CEVE 511	ATMOSPHERIC CHEMISTRY AND CLIMATE	
CEVE 514	COASTAL HAZARDS IN A CHANGING CLIMATE	
CEVE 521	CLIMATE RISK MANAGEMENT	
CEVE 526	SMART MATERIALS FOR THE ENVIRONMENT	
Department Approved Area of Specialization Electives		
Select up to 4 courses from the following:		*0-12*
CEVE 509	HYDROLOGY AND WATER RESOURCES ENGINEERING	
CEVE 534	FATE AND TRANSPORT OF CONTAMINANTS IN THE ENVIRONMENT	
CEVE 544	ENVIRONMENTAL MICROBIOLOGY AND MICROBIAL ECOLOGY	
CEVE 547	WATER-ENERGY NEXUS	
Total Credit Hours		**18**

Area of Specialization: Resilient Urban Infrastructure

Code	Title	Credit Hours
Core Requirements		
Select up to 6 courses from the following:		*6-18*
CEVE 514	COASTAL HAZARDS IN A CHANGING CLIMATE	
CEVE 521	CLIMATE RISK MANAGEMENT	
CEVE 524	TIME-DEPENDENT SYSTEM RELIABILITY METHODS AND APPLICATIONS	

or CEVE 592	MODELING AND ANALYSIS OF NETWORKED SYSTEMS	
CEVE 525	SUSTAINABLE INFRASTRUCTURE MATERIALS	
CEVE 545	ORIGAMI ENGINEERING	
CEVE 562	INFRASTRUCTURE RESILIENCE TO MULTIPLE HAZARDS	
or CEVE 560	BRIDGE ENGINEERING AND EXTREME EVENTS	
Department Approved Area of Specialization Electives		
Select up to 4 courses from the following:		*0-12*
CEVE 526	SMART MATERIALS FOR THE ENVIRONMENT	
CEVE 527 / MECH 527	PHYSICS GUIDED MACHINE LEARNING & DATA DRIVEN MODELING FEM	
CEVE 543	STATISTICAL-PHYSICAL METHODS FOR HYDROCLIMATE EXTREMES AND CATASTROPHES	
CEVE 596 / MECH 566	SYSTEM IDENTIFICATION OF DYNAMIC SYSTEMS WITH MACHINE LEARNING	
Total Credit Hours		**18**

Area of Specialization: Structural Engineering and Multi-Scale Mechanics

Code	Title	Credit Hours
Core Requirements		
Select up to 6 courses from the following:		*6-18*
CEVE 500 / MECH 500	ADVANCED MECHANICS OF MATERIALS	
CEVE 503 / MECH 520	NONLINEAR FINITE ELEMENT ANALYSIS	
CEVE 527 / MECH 527	PHYSICS GUIDED MACHINE LEARNING & DATA DRIVEN MODELING FEM	
or CEVE 596 / MECH 566	SYSTEM IDENTIFICATION OF DYNAMIC SYSTEMS WITH MACHINE LEARNING	
CEVE 539	ADVANCED STRUCTURAL ANALYSIS	
CEVE 576 / MECH 576	STRUCTURAL DYNAMIC SYSTEMS	
or CEVE 560	BRIDGE ENGINEERING AND EXTREME EVENTS	
CEVE 678 / MECH 678	APPLIED STOCHASTIC MECHANICS	
or CEVE 679 / MECH 679	APPLIED MONTE CARLO ANALYSIS	
Department Approved Area of Specialization Electives		
Select up to 4 courses from the following:		*0-12*
CEVE 531	DESIGN AND BEHAVIOR OF CONCRETE BUILDINGS AND BUILDING ELEMENTS	
CEVE 541	DESIGN AND BEHAVIOR OF STRUCTURAL STEEL BUILDINGS AND BUILDING ELEMENTS	
CEVE 578	EARTHQUAKE ENGINEERING	
CEVE 592	MODELING AND ANALYSIS OF NETWORKED SYSTEMS	
Total Credit Hours		**18**

Area of Specialization: Sustainable Water Management

Code	Title	Credit Hours
Core Requirements		
Select up to 6 courses from the following:		*6-18*
CEVE 501	CHEMISTRY FOR ENVIRONMENTAL ENGINEERING AND SCIENCE	
or CEVE 550	ENVIRONMENTAL ORGANIC CHEMISTRY	
CEVE 509	HYDROLOGY AND WATER RESOURCES ENGINEERING	
or CEVE 518	ENVIRONMENTAL HYDROGEOLOGY	
CEVE 535	PHYSICAL CHEMICAL PROCESSES FOR WATER QUALITY CONTROL	
or CEVE 534	FATE AND TRANSPORT OF CONTAMINANTS IN THE ENVIRONMENT	
CEVE 536	ENVIRONMENTAL BIOTECHNOLOGY AND BIOREMEDIATION	
CEVE 544	ENVIRONMENTAL MICROBIOLOGY AND MICROBIAL ECOLOGY	
CEVE 547	WATER-ENERGY NEXUS	
Department Approved Area of Specialization Electives		
Select up to 4 courses from the following:		*0-12*
CEVE 520	ENVIRONMENTAL REMEDIATION RESTORATION	
CEVE 526	SMART MATERIALS FOR THE ENVIRONMENT	
CEVE 562	INFRASTRUCTURE RESILIENCE TO MULTIPLE HAZARDS	
CEVE 592	MODELING AND ANALYSIS OF NETWORKED SYSTEMS	

Policies for the PhD Degree in the field of Civil and Environmental Engineering

Department of Civil and Environmental Engineering Graduate Program Handbook

The General Announcements (GA) is the official Rice curriculum. As an additional resource for students, the department of Civil and Environmental Engineering publishes a graduate program handbook, which can be found here: https://gradhandbooks.rice.edu/2025_26/Civil_Environmental_Engineering_Graduate_Handbook.pdf.

Admission

Applicants pursuing graduate education in structural engineering, structural mechanics, and geotechnical engineering should have a BS in Civil Engineering with a significant emphasis on structural engineering, but students with other undergraduate degrees may apply if they have adequate preparation in mathematics, mechanics, and structural analysis and design.

Successful applicants typically have at least a 3.00 (B) grade point average in undergraduate work and high Graduate Record Examination (GRE) scores. For general university requirements, see Graduate Degrees (https://ga.rice.edu/graduate-students/academic-opportunities/degrees/) and Admission to Graduate Study (https://ga.rice.edu/graduate-students/academic-policies-procedures/admission/).

Transfer Credit

For Rice University's policy regarding transfer credit, see Transfer Credit (https://ga.rice.edu/graduate-students/academic-policies-procedures/regulations-procedures-all-degrees/#transfer). Some departments and programs have additional restrictions on transfer credit. Requests for transfer credit must be approved for Rice equivalency by the appropriate academic department offering the Rice equivalent course (corresponding to the subject code of the course content) and by the Office of Graduate and Postdoctoral Studies (GPS). Students are encouraged to meet with their academic program's advisor when considering transfer credit possibilities.

Additional Information

For additional information, please see the Civil and Environmental Engineering website: https://cee.rice.edu/.

Opportunities for the PhD Degree in the field of Civil and Environmental Engineering

Fellowships and Opportunities

- **NASA Internships:** multiple opportunities are available for undergraduate and graduate students for spring and fall semesters, as well as year-long appointments.
- **NRC Research Associateship Program:** the National Academies of Sciences, Engineering, and Medicine offer paid postdoctoral, senior, and graduate fellowships.
- **NASA Fellowships and other opportunities:** NASA offers several internships, fellowships, and scholarships for both undergraduate and graduate students.
- **NSF Graduate Research Fellowship Program (NSF-GRFP):** provides fellowships to individuals selected early in their graduate careers based on their demonstrated potential for significant achievements in science and engineering.
- **Fullbright-Hays Doctoral Dissertation Research Abroad Program (DDRA):** provides grants to fund individual doctoral students to conduct research in other countries in modern foreign languages and area studies for periods of 6 to 12 months.
- **DOE Computational Science Graduate Fellowship:** The Department of Energy Computational Science Graduate Fellowship (DOE CSGF) program provides outstanding benefits and opportunities to students pursuing doctoral degrees in fields of study that utilize high performance computing to solve complex problems in science and engineering.
- **DOD National Defense Science and Engineering Graduate Fellowship (NDSEG):** it is a highly competitive portable fellowship that is awarded to US citizens and nationals who intend to pursue a doctoral degree in one of fifteen supported disciplines.
- **Pathways to Science:** it is a project of the Institute for Broadening Participation. The organization places emphasis on connecting underrepresented groups with STEM programs, funding, mentoring, and resources. Fellowships for masters and doctoral students are available, as is funding for travel and summer institutes.

Student Clubs

- **Civil and Environmental Department Graduate Student Association:** The main purpose of the club is to 1) foster better professional and personal relationships among students and between students and faculty members 2) provide a forum for concerns, both professional and personal, about graduate student life and 3) foster professional growth through mentoring, recruitment, and affiliate/internship relationships.
- **Earthquake Engineering Research Institute:** https://eeri.rice.edu/ The objective of this student chapter is to encourage, facilitate, and promote learning and interest among students in the field of earthquake engineering through interaction with professionals and experts and through interdisciplinary involvement.

Additional Information

For additional information, please see the Civil and Environmental Engineering website: https://cee.rice.edu/.