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

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

Upon completing the PhD degree in the field of Civil 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 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 Civil Engineering must:

- Complete 90 credit hours at the 500-level or 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.
  - For students focusing on civil, structural engineering, and mechanics, coursework must include one course in each of the following areas: structural mechanics and FEM, structural dynamic systems, earthquake engineering, probabilistic mechanics, and applied mathematics. Comparable coursework completed previously may be substituted for these core courses. A minimum grade of B- (2.67 grade points) must be achieved for each of these core courses, as well as a minimum GPA of 3.00.
- Spend at least four semesters in full-time study at Rice and successfully accomplish the following:
  - Pass a preliminary examination in civil 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.

Civil engineering graduate 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 Engineering | | 90 |

### Degree Requirements

| Code | Title | Credit Hours |
|---|---|---|
| **Core Requirements** [1] | | |
| *Select 6 courses from the following:* | | *18* |
| CEVE 500 | ADVANCED MECHANICS OF MATERIALS | |
| CEVE 503 | NONLINEAR FINITE ELEMENT ANALYSIS | |
| CEVE 514 | COASTAL HAZARDS IN A CHANGING CLIMATE | |
| CEVE 524 | TIME-DEPENDENT SYSTEM RELIABILITY METHODS AND APPLICATIONS | |
| CEVE 525 | SUSTAINABLE INFRASTRUCTURE MATERIALS | |

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| CEVE 527 | PHYSICS GUIDED MACHINE LEARNING & DATA DRIVEN MODELING FEM | |
| CEVE 531 | DESIGN AND BEHAVIOR OF CONCRETE BUILDINGS AND BUILDING ELEMENTS | |
| CEVE 539 | ADVANCED STRUCTURAL ANALYSIS | |
| CEVE 541 | DESIGN AND BEHAVIOR OF STRUCTURAL STEEL BUILDINGS AND BUILDING ELEMENTS | |
| CEVE 543 | DATA-DRIVEN MODELS FOR CLIMATE HAZARD | |
| CEVE 545 | ORIGAMI ENGINEERING | |
| CEVE 560 | BRIDGE ENGINEERING AND EXTREME EVENTS | |
| CEVE 562 | INFRASTRUCTURE RESILIENCE TO MULTIPLE HAZARDS | |
| CEVE 576 | STRUCTURAL DYNAMIC SYSTEMS | |
| CEVE 578 | EARTHQUAKE ENGINEERING | |
| CEVE 592 | MODELING AND ANALYSIS OF NETWORKED SYSTEMS | |
| CEVE 596 | SYSTEM IDENTIFICATION OF DYNAMIC SYSTEMS WITH MACHINE LEARNING | |
| CEVE 678 | APPLIED STOCHASTIC MECHANICS | |
| CEVE 679 | APPLIED MONTE CARLO ANALYSIS | |
| **Additional Coursework as Approved by the Department** | | **72** |
| **Total Credit Hours** | | **90** |

# Policies for the PhD Degree in the field of Civil 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/2024_25/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 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

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