Civil and Environmental Engineering, PhD

Graduate study in civil and environmental engineering prepares students for professional careers and further study. The principal concentration areas are environmental engineering and environmental science; hydraulics, hydrology, and water resources; structures, mechanics, and materials; sustainable water development; and transportation.

Research and Study Areas

Structures, Mechanics, and Materials

The structures, mechanics, and materials curriculum is designed for students who wish to gain knowledge and skill in the mechanics of solids and structures that they can apply to civil infrastructure systems and other fields. The program concentrates on developing appropriate methodologies for tackling broad, complex issues related to civil infrastructure systems and on educating engineers in the implementation and application of methodologies to actual engineering projects. Faculty members have expertise in structural engineering, design optimization, solid mechanics, and computational methods.

Transportation Engineering

The transportation engineering curriculum is geared toward students interested in developing specialized knowledge and skills applicable to the diverse set of issues associated with transportation. Faculty members have expertise in traffic engineering, infrastructure management systems, pavement engineering, advanced construction materials, dynamic load and pavement simulation, optimal design, winter highway maintenance, real-time simulation, human factors, intelligent sensors, nondestructive testing, transportation planning, and travel demand modeling.

Water and the Environment

The water and the environment graduate program focuses on both fundamental and applied aspects of environmental systems and processes across a range of scales. The water and the environment program offers unique opportunities for students to actively participate in the research, analysis, and design aspects of real-world problems. There are three areas of specialization: environmental engineering and science; hydraulics, hydrology, and water resources; and sustainable water development.

The environmental engineering and science curriculum provides a comprehensive base of coursework and research in the areas of air and water quality management; environmental chemistry and microbiology; natural systems modeling; and processes for water supply, pollution control, and solid and hazardous waste management.

The hydraulics, hydrology, and water resources curriculum is associated with IIHR—Hydroscience and Engineering, a world-renowned research institute, where senior staff members of the institute are professors in the program. IIHR offers unique curriculum opportunities in laboratory and field-scale experimentation and in mathematical modeling with IIHR's high-speed computer facilities.

The sustainable water development curriculum is focused on training interdisciplinary professional engineers, researchers, educators, and those who are ready to meet the water resource challenges of communities most in need. Community service and professional development experiences complement innovative research at the food, energy, and water nexus.

Across all specialization areas within water and the environment, interdisciplinary research and study are conducted with programs including the Center for Global and Regional Environmental Research, the Center for Health Effects of Environmental Contamination, the Center for Hydrologic Development, the Iowa Flood Center, the Iowa Superfund Research Program, the Hazardous Substances Research Center, and the Center for Biocatalysis and Bioprocessing; the departments of Chemical and Biochemical Engineering (College of Engineering), Microbiology and Immunology (Carver College of Medicine), and Occupational and Environmental Health (College of Public Health); the School of Earth, Environment, and Sustainability (College of Liberal Arts and Sciences); and the School of Planning and Public Affairs (Graduate College). Other areas of interdisciplinary focus include groundwater contamination, biotechnology, global climate change, and hazardous substances.

Learning Outcomes

Students will gain the ability to:

- apply critical thinking skills and principles of engineering and science to solve problems that address societal needs;
- communicate effectively with a range of audiences;
- make ethical and professional judgments that consider the global, economic, environmental, and societal contexts of their decisions and proposed engineering solutions; and
- conduct original research that advances discovery through the use of modern research tools and methodologies.

Requirements

The Doctor of Philosophy program in civil and environmental engineering requires a minimum of 72 s.h. of graduate coursework, including at least 43 s.h. in formal coursework. Students may count a maximum of 29 s.h. in CEE:7999 Research: Civil and Environmental Engineering PhD Dissertation toward the degree. Students must maintain a UI cumulative grade-point average of at least 3.00.

Students may count up to 24 s.h. from the MS in civil and environmental engineering or from another qualified graduate program toward the PhD with departmental approval.

All students usually need at least three years of full-time graduate study to complete the degree. They must pass a qualifying examination and must pass a written and oral comprehensive examination before they may be formally admitted to PhD candidacy; the comprehensive examination is usually taken after all required coursework has been completed. Students devote one year to the preparation of a dissertation that contributes to knowledge in the field; they must defend their dissertation successfully in a final examination.

Core Courses

Students must successfully complete the appropriate civil and environmental graduate core courses for their area of focus.

They are expected to complete core courses during their first year of study.

Elective Courses

Students should choose elective courses from any academic area that strengthens their knowledge in their area of focus and provides needed research topic training. Independent study, such as CEE:5998 Individual Investigations: Civil and Environmental Engineering, is not considered a suitable elective.

Seminars

All full-time students are required to register for and participate in seminars in their respective program of study. This includes CEE:5096 Water, Energy, and Food Nexus Seminar for areas that fall under the water and the environment curriculum (environmental engineering, environmental science, hydraulics, sustainable water development, and water resources) or CEE:5098 Graduate Seminar in Structures, Materials, Mechanics, and Transportation for students in transportation engineering or structures, mechanics, and materials. Depending on the program of study, there may be additional seminar requirements.

Ethics Course

Students must enroll in ENGR:7270 Engineering Ethics.

Dissertation

Students must complete a dissertation and may apply up to 29 s.h. in CEE:7999 Research: Civil and Environmental Engineering PhD Dissertation toward the degree. A total of 6 s.h. may be taken on an A–F graded basis at the discretion of the advisor.

Admission

Applicants must meet the admission requirements of the Graduate College; see the Manual of Rules and Regulations on the Graduate College website.

Each of the program's curricula is flexible; students may be admitted from all disciplines of engineering as well as from the mathematical and basic sciences.

Applicants should have a graduate grade-point average (GPA) of at least 3.00. Those with GPAs slightly lower should contact the department.

Graduate Record Examination (GRE) General Test scores are not required.

Career Advancement

Graduates are placed in advanced technical positions in academia, industry, consulting firms, or government.

Engineering Career Services develops and promotes experiential education and professional opportunities for students in the College of Engineering. Professional staff coordinate the college's co-op and internship program, engage in employer outreach, and provide opportunities for students to network with employers, including engineering career fairs and other programming related to career development.

Engineering Career Services offers individual advising and class presentations on résumé and cover letter preparation, job and internship search strategies, interviewing skills, job offer evaluation, and much more. Engineering Career Services partners with the Pomerantz Career Center to facilitate on-campus interviewing, postgraduate outcome collection, and the university's online recruiting system, Handshake.

Academic Plans

Sample Plans of Study

Sample plans represent one way to complete a program of study. Actual course selection and sequence will vary and should be discussed with an academic advisor. For additional sample plans, see MyUI.

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Environmental Engineering Subprogram

This sample plan is currently being reviewed and will be added at a later date.

Environmental Science Subprogram

This sample plan is currently being reviewed and will be added at a later date.

Hydraulics Subprogram

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Structures, Mechanics and Materials Subprogram

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Sustainable Water Development Subprogram

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Transportation Subprogram

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Water Resources Subprogram

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