Civil and Environmental Engineering, Ph.D.

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

Environmental Engineering and Science

The environmental engineering and science curriculum provides a comprehensive base of course work 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. Interdisciplinary specialization and study are conducted with programs including IIHR—Hydroscience & Engineering, the Center for Global and Regional Environmental Research, the Center for Health Effects of Environmental Contamination, the Hazardous Substances Research Center, the Center for Biocatalysis and Bioprocessing, the Departments of Chemical and Biochemical Engineering, Earth and Environmental Sciences, Geographical and Sustainability Sciences, Microbiology and Immunology, Occupational and Environmental Health; and the School of Urban and Regional Planning. Other areas of interdisciplinary focus include groundwater contamination, biotechnology, global climate change, and hazardous substances.

Hydraulics, Hydrology, and Water Resources

The graduate program in hydraulics, hydrology, and water resources prepares students for careers by providing a strong theoretical and applied foundation, and a broad-based academic background, necessary for positions in engineering design, research, and academia. The program combines hydraulics, fluid mechanics, hydrology, and water resources with elements from environmental engineering, meteorology, remote sensing and systems analysis, and related disciplines such as mathematics, statistics, electrical and computer science engineering, geology, and geographical information systems.

The hydraulics, hydrology, and water resources curriculum is associated with IIHR—Hydroscience & Engineering, a world-renowned research institute. All the professors in the program are research engineers at the institute. IIHR, a leading laboratory in fluids-related fundamental and applied research, offers unique opportunities for students to participate actively in the research of real-world problems—including river health and restoration, hydraulic structures for urban water management and fish passage, and wind energy—providing interdisciplinary education for future leaders in science and engineering, and advancing knowledge in support of sustainable natural and engineered systems.

Most of the faculty members in the hydraulics, hydrology, and water resources program also are part of the Iowa Flood Center, the only academic flood center in the nation. By training and educating a workforce knowledgeable in the flood-related sciences, the Iowa Flood Center provides students with the opportunity to work on improving flood monitoring and prediction capabilities, and on developing models for flood frequency estimation and real-time forecasting.

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.

Sustainable Water Development

The sustainable water development curriculum is a revolutionary new approach to graduate education. This program 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. Students are encouraged to tailor the curriculum to fit unique interests and career goals—everything from politics to public health, chemistry to microbiology, and informatics to entrepreneurship. Students involve themselves with innovative research at the food, energy, and water nexus, focusing on the impacts of climate change, resource recovery from waste, and technologies for sustainable and healthy communities, among other areas. Community service and professional development, including immersive internships with diverse project partners, complement transformative research.

Transportation Engineering

The transportation engineering curriculum aims 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.

Requirements

The Doctor of Philosophy program in civil and environmental engineering requires a minimum of 72 s.h. of graduate credit. Students must maintain a g.p.a. of at least 3.00 throughout the program. The doctoral degree is granted primarily on the basis of achievement rather than on a prescribed course of study.

Students usually need at least three years of full-time graduate study to complete the degree. All students must pass a qualifying examination. Students also must pass a written and oral comprehensive examination before they may be formally admitted to Ph.D. candidacy; the comprehensive examination usually is taken after all required course work 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.

Consult the department's Graduate Student Manual for more detailed information about the Ph.D. program in civil and environmental engineering.

Admission

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

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 g.p.a. of at least 3.00. Those with grade-point averages slightly lower should contact the department.

Applicants should have a combined verbal and quantitative score of at least 301 on the Graduate Record Examination (GRE) General Test. Lower scores are considered with other evidence of academic promise (recommendation letters, grade-point average). GRE General Test scores also are used in financial aid decisions.

Financial Support

A significant number of research assistantships are available on a variety of research projects, and a limited number of teaching assistantships may be available. Selection of recipients usually is based on scholastic achievement and research interest.

Career Advancement

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

Engineering Professional Development (EPD) develops and promotes experiential education and professional opportunities for students. 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 an engineering career fair and other career-development programming each semester.

EPD also offers individual advising and class presentations on résumé and cover letter preparation, job and internship search strategies, interviewing skills, and job offer evaluation.