Civil and Environmental Engineering, MS

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), Earth and Environmental Sciences, Geographical and Sustainability Sciences (College of Liberal Arts and Sciences), Microbiology and Immunology (Carver College of Medicine), and Occupational and Environmental Health (College of Public Health); 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 an ability to:

• apply principles of engineering and science for problem solving to meet 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 research through the use of modern research tools and methodologies (thesis students only).

Requirements

The Master of Science program in civil and environmental engineering requires a minimum of 30 s.h. of graduate credit for thesis students; 31 s.h. for nonthesis students. The program enables students to concentrate in one or more areas of their choice. Students must maintain a cumulative grade-point average of at least 2.75.

The thesis option requires a minimum of 25 s.h. (eight courses) with the remaining 5 s.h. obtained in CEE:5999 Research: Civil and Environmental Engineering MS Thesis.

With the approval of their advisor, students develop a study plan that satisfies the requirements of their chosen curriculum. Students must pass an oral examination and, in some program options, a written examination.

Consult the department’s Graduate Program Resources web page for more detailed information about the MS program in civil and environmental engineering.

Core Courses
All students must successfully complete the civil and environmental graduate core courses for their area of focus. Students are expected to complete these courses during their first year of study.
Elective Courses
Students choose elective courses from any academic area that strengthens their knowledge in their area of focus and provides needed research topic training. Individual Investigations: Civil and Environmental Engineering (CEE:5998) is not considered a suitable elective.

Seminars
All full-time students are required to register for and participate in a seminar 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.

Thesis
Students may earn up to 5 s.h. of research credit in CEE:5999 Research: Civil and Environmental Engineering MS Thesis. A total of 3 s.h. may be taken on a graded basis at the discretion of the advisor.

Combined Programs

MS (Sustainable Water Development Subprogram)/MS in Urban and Regional Planning

The Department of Civil and Environmental Engineering and the School of Planning and Public Affairs collaborate to offer a combined Master of Science in civil and environmental engineering with a sustainable water development subprogram/Master of Science in urban and regional planning.

Separate application to each degree program is required. Applicants must be admitted to both programs before they may be admitted to the combined degree program. For more information, see the MS in urban and regional planning (Graduate College) in the catalog.

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 cumulative undergraduate grade-point average (GPA) of at least 3.00. Those with GPAs slightly lower should contact the department.

Beginning with fall 2022 applicants, Graduate Record Examination (GRE) General Test scores are no longer required.

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
Current and projected demand for MS graduates is excellent. Graduates are placed in advanced technical positions in industry, consulting firms, or government, or they may continue their graduate study. On average, 93-98% of graduates are employed in their field of study or pursuing advanced education within seven months of graduation.

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 resume 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, postgraduation 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.

Civil and Environmental Engineering, MS

- Environmental Engineering Subprogram [p. 2]
- Environmental Science Subprogram [p. 3]
- Hydraulics Subprogram [p. 3]
- Structures, Mechanics and Materials Subprogram [p. 4]
- Sustainable Water Development Subprogram [p. 4]
- Transportation Subprogram [p. 5]
- Water Resources Subprogram [p. 5]

Environmental Engineering Subprogram
Course                    Title                        Hours
Academic Career
Any Semester
31 s.h. of graduate level coursework must be completed; graduate transfer credits allowed upon approval. More information is included in the General Catalog and on department website.
### Environmental Science Subprogram

<table>
<thead>
<tr>
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<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
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<td></td>
</tr>
<tr>
<td>CEE:5380</td>
<td>Fluid Flows in Environmental Systems</td>
<td>3</td>
</tr>
<tr>
<td>CEE:5410</td>
<td>Politics and Economics of the Food, Energy, Water Nexus</td>
<td>3</td>
</tr>
<tr>
<td>CEE:5440</td>
<td>Foundations of Environmental Chemistry and Microbiology</td>
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<tr>
<td>CEE Elective course</td>
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<tr>
<td>ENGR:7270</td>
<td>Engineering Ethics c</td>
<td>1</td>
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<tr>
<td>CEE:5096</td>
<td>Water, Energy, and Food Nexus Seminar d</td>
<td>0</td>
</tr>
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<td><strong>Spring</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEE:5310</td>
<td>Informatics for Sustainable Systems</td>
<td>3</td>
</tr>
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<td>Watershed Hydrology and Ecosystem Processes</td>
<td>3</td>
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<td>Water, Energy, and Food Nexus Seminar d</td>
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<tr>
<td>Final Exam</td>
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<td>15</td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
<td></td>
<td>31</td>
</tr>
</tbody>
</table>

- **First Year**
  - Fall
    - CEE:5380: 3
    - CEE:5410: 3
    - CEE:5440: 3
    - CEE Elective course: 3 (b)
    - ENGR:7270: 1 (c)
    - CEE:5096: 0 (d)
  - Spring
    - CEE:5310: 3
    - CEE:5350: 3
    - CEE Elective course: 3 (b)
    - CEE Elective course: 3 (b)
    - CEE:5096: 0 (d)
  - Final Exam: 15 (e)

- **Total Hours**: 31

- **Hydraulics Subprogram**

- **Academic Career**
  - Any Semester
    - 31 s.h. of graduate level coursework must be completed; graduate transfer credits allowed upon approval. More information is included in the General Catalog and on department website. **(a)**

- **First Year**
  - Fall
    - CEE:5380: 3
    - CEE:5410: 3
    - CEE:5440: 3
    - CEE Elective course: 3 (b)
    - ENGR:7270: 1 (c)
    - CEE:5096: 0 (d)
  - Spring
    - CEE:5310: 3
    - CEE:5350: 3
    - CEE Elective course: 3 (b)
    - CEE Elective course: 3 (b)
    - CEE:5096: 0 (d)

- **Final Exam**: 16 (e)

- **Total Hours**: 16

- **Hydraulics Subprogram**

- **Academic Career**
  - Any Semester
    - 31 s.h. of graduate level coursework must be completed; graduate transfer credits allowed upon approval. More information is included in the General Catalog and on department website. **(a)**

- **First Year**
  - Fall
    - CEE:5380: 3
    - CEE:5410: 3
    - CEE:5440: 3
    - CEE Elective course: 3 (b)
    - ENGR:7270: 1 (c)
    - CEE:5096: 0 (d)
  - Spring
    - CEE:5310: 3
    - CEE:5350: 3
    - CEE Elective course: 3 (b)
    - CEE Elective course: 3 (b)
    - CEE:5096: 0 (d)

- **Final Exam**: 16 (e)

- **Total Hours**: 16
Students must complete specific requirements in the University of Iowa Graduate College after program admission. Refer to the Graduate College website and the Manual of Rules and Regulations for more information.

Work with academic advisor to determine elective graduate coursework and sequence. See General Catalog and CEE website for specifics.

Must be completed during first semester.

Required every semester.

Final exam is required for some program areas. Refer to Graduate Program Resources on the CEE website for details.

### Structures, Mechanics and Materials Subprogram

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<thead>
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<td>31 s.h. of graduate level coursework must be completed; more information is included in the General Catalog and on department website.</td>
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<td>First Year Fall</td>
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<td>CEE Core course</td>
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<td>CEE:5990</td>
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<td>Engineering Ethics</td>
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<td>Spring</td>
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<td>CEE Core course</td>
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<tr>
<td>CEE:5991</td>
<td>Structural Engineering Practicum B</td>
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<tr>
<td>CEE:5098</td>
<td>Graduate Seminar in Structures, Materials, Mechanics, and Transportation</td>
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<tbody>
<tr>
<td>CEE:4560</td>
<td>Pavement Engineering</td>
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<td>CEE:5678</td>
<td>Application Simulation to Transportation</td>
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<td>ENGR:7270</td>
<td>Engineering Ethics</td>
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<tr>
<td>CEE:5098</td>
<td>Graduate Seminar in Structures, Materials, Mechanics, and Transportation</td>
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<td>CEE Elective course</td>
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</table>

### First Year

#### Fall

- **CEE:5310** Informatics for Sustainable Systems **3**
- **CEE:4560** Pavement Engineering **3**
- **CEE:5678** Application Simulation to Transportation **3**
- **CEE Elective course** **3**
- **CEE Elective course** **3**
- **ENGR:7270** Engineering Ethics **1**
- **CEE:5098** Graduate Seminar in Structures, Materials, Mechanics, and Transportation **0**

#### Spring

- **CEE:4730** Transportation Infrastructure Construction and Management **3**
- **STAT:4100 or STAT:4200** Mathematical Statistics I or Statistical Methods and Computing **3**
- **CEE Elective course** **3**
- **CEE Elective course** **3**
- **CEE Elective course** **3**
- **CEE:5098** Graduate Seminar in Structures, Materials, Mechanics, and Transportation **0**
- **CEE Elective course** **3**
- **CEE Elective course** **3**
- **CEE Elective course** **3**
- **CEE:5096** Water, Energy, and Food Nexus Seminar **0**

#### Final Exam

<table>
<thead>
<tr>
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<tr>
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### Total Hours

**31**

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b Work with academic advisor to determine elective graduate coursework and sequence. See General Catalog and CEE website for specifics.
c Must be completed during first semester.
d Required every semester.
e Final exam is required for some program areas. Refer to Graduate Program Resources on the CEE website for details.

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<td>3</td>
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<td>ENGR:7270</td>
<td>Engineering Ethics</td>
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</tr>
<tr>
<td>CEE:5096</td>
<td>Water, Energy, and Food Nexus Seminar</td>
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</tr>
</tbody>
</table>

### First Year

#### Fall

- **CEE:5310** Informatics for Sustainable Systems **3**
- **CEE:5410** Politics and Economics of the Food, Energy, Water Nexus **3**
- **CEE:5440** Foundations of Environmental Chemistry and Microbiology **3**
- **CEE Elective course** **3**
- **CEE Elective course** **3**
- **ENGR:7270** Engineering Ethics **1**
- **CEE:5096** Water, Energy, and Food Nexus Seminar **0**

### Spring

- **CEE:4730** Transportation Infrastructure Construction and Management **3**
- **CEE:5350** Watershed Hydrology and Ecosystem Processes **3**
- **CEE Elective course** **3**
- **CEE Elective course** **3**
- **CEE Elective course** **3**
- **CEE:5096** Water, Energy, and Food Nexus Seminar **0**

#### Final Exam

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