PH.D. IN CIVIL ENGINEERING

Overview
The Department of Civil, Architectural, and Environmental Engineering (CAE) offers a Doctor of Philosophy (Ph.D.) degree in Civil Engineering with the following areas of emphasis:

• Civil Engineering
• Architectural Engineering
• Environmental Engineering

The educational objectives of the Doctor of Philosophy program in Civil Engineering are to produce graduates whom:

1. Have advanced technical knowledge in at least one specialty area of civil engineering
2. Have advanced capability to apply advanced knowledge to engineering problems
3. Have made significant contributions in at least one specialty area of civil engineering

The specialty areas of study for the Ph.D. include:

• Structural Engineering and Structural Materials
• Environmental Engineering
• Water Resources Engineering
• Integrated Building Systems
• Mechanical, Electrical, and Plumbing (MEP) Systems

For students who already have an earned Master of Science (in either civil, architectural, or environmental engineering), 30 graduate-level credits are required beyond the M.S. degree. For students who do not have an M.S. (in civil, architectural, or environmental engineering), a minimum of 60 graduate-level credits are required beyond the B.S. degree. All students are required to engage in supervised research and defend a dissertation.

The Program of Study is the student’s specific set of coursework that defines the course requirements for graduation and must be approved by an advisory committee (known as the Supervisory Committee). Depending on whether the student already has an earned M.S. degree, the Ph.D. degree can typically be completed within two to five years.

Curriculum Requirements
For a Ph.D. following an M.S.
For students who already have an earned M.S. (in civil, architectural, or environmental engineering), a minimum of 30 graduate-level credits are required beyond the B.S. degree with an average of "B" or better and no grade below a "C". Of the credits:

• At least 18 credits in CAE
• At least 18 credits of lecture-based and/or Independent Study courses
• At least 6 credits of lecture-based CAE courses at the 700 level (not Independent Study)
• 12 credits of Doctoral Dissertation (CAE 830 and/or CAE 840)
• A total of 6 credits of transfer and/or exchange coursework (not counted towards the B.S. or M.S. degrees) may be taken at another institution and used to satisfy the requirements for the Ph.D. degree.

The table presents an overview of the courses selection:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAE 830 and/or CAE 840</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>2 CAE 700 Level Lecture-Based Courses</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>4 Elective Courses</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Total Credit Hours</td>
<td></td>
<td>30</td>
</tr>
</tbody>
</table>

Note: All courses, except Dissertation, are 3 credit hours unless otherwise indicated. Refer to the Additional Details section (below) for additional options and restrictions.
For a Ph.D. without prior M.S.

For students who do not have an M.S. (in civil, architectural, or environmental engineering), a minimum of 60 graduate-level credits are required beyond the B.S. degree with an average of "B" or better and no grade below "C". Of the 60 credits:

- At least 42 credits of lecture-based and/or Independent Study courses
- At least 12 credits of lecture-based CAE courses at the 700 level (not Independent Study)
- At least 30 credits in CAE
- 18 credits of Doctoral Dissertation (CAE 830 and/or CAE 840)
- A total of 12 credits of transfer and/or exchange coursework (not counted towards the B.S. or M.S. degrees) may be taken at another institution and used to satisfy the requirements for the Ph.D. degree.

The table presents an overview of the course selection:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAE 830 and/or CAE 840</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>4 CAE 700 Level Lecture-Based Courses</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>10 Elective Courses</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>Total Credit Hours</td>
<td></td>
<td>60</td>
</tr>
</tbody>
</table>

Note: All courses, except Dissertation, are 3 credit hours unless otherwise indicated. Refer to the Additional Details section (below) for additional options and restrictions.

Qualifying Examination

A Ph.D. student must pass a Qualifying Examination, generally taken at the end of the first year of study, before being allowed to defend a dissertation proposal. The examination, administered by the student’s Supervisory Committee, must consist of a written component, and may also include an oral component if deemed appropriate by the Supervisory Committee. Three outcomes of the examination are possible: Pass, Fail, and Fail with option to retake once. For students retaking the exam, the Committee will determine a suitable time frame, but not to exceed 6 months.

Dissertation Proposal Defense

Subsequent to passage of the Qualifying Examination, the student can defend his/her Dissertation Proposal to their Dissertation Committee, which is typically the same as the student’s Supervisory Committee or, if not, has makeup equivalent to the Supervisory Committee. All Committee members must approve the Proposal.

Admission to Candidacy

Admission of the student to Candidacy is subject to passage of the Qualifying Examination and passage of the oral Dissertation Proposal Defense.

Dissertation Defense

The Ph.D. thesis must be defended to, approved by, and signed by the student’s Dissertation Committee, which is typically the same as the student’s Supervisory Committee or, if not, has a composition that is equivalent to the Supervisory Committee.

Additional Details

- Master’s Design Project (CAE 604) will not count towards the Ph.D. degree requirements.
- Internships, Practical Training, workshops, or other types of practicum are neither required nor optional credit-earning components in the established graduate curriculum (Program of Study). Credit earned through these experiences (such as UMI 605) will not count towards any CAE degree requirements. Courses CAE 665 - 669 and CAE 765 - 769 shall not count towards the degree.
- At a minimum, a qualifying exam and a final public oral examination in defense of the thesis are required.
- The Supervisory Committee (and Dissertation Committee) must have a minimum of 4 members, including:
  1. Committee Chair (Advisor) shall be full-time CAE faculty and a member of the Graduate Faculty.
  2. CAE faculty and a member of the Graduate Faculty
  3. CAE faculty and a member of the Graduate Faculty
  4. Non-CAE member with an earned Ph.D.

Mission

The mission of the Department of Civil, Architectural, and Environmental Engineering is to:

- Provide high-quality undergraduate and graduate education in civil, architectural, and environmental engineering that will prepare graduates for professional careers and a lifetime of learning;
• Conduct high-quality research that will advance the body of knowledge and improve the quality of human life; and
• Serve the engineering profession and society through active involvement in professional organizations and contribution of professional expertise.

Goals
The educational objectives of the Ph.D. program are to produce graduates whom:

• Have advanced technical knowledge in at least one specialty area of civil engineering;
• Have advanced capability to apply advanced knowledge to engineering problems; and
• Have made significant contributions in at least one specialty area of civil engineering.

[Specialty areas include structural, environmental, water-resources, and architectural engineering.]

Student Learning Outcomes
• Students will demonstrate an advanced knowledge of the discipline (mathematics, science, and engineering), including methodology relevant to a specialty area.
• Students will demonstrate an advanced ability to identify, formulate, and solve engineering problems to carry out supervised research.
• Students will demonstrate an advanced ability to generate technical contributions and effectively communicate them to the scientific community.