GENERAL INFORMATION

The Transportation and Urban Engineering (TUE) Area of Concentration can be selected with either the Master of Science (MS) or Doctor of Philosophy (PhD) in the Civil Engineering Field of Study. The MS degree may be either research-based (Plan A) or project-based (Plan B). Plan A students often pursue further PhD studies, or careers in research and development in government and private institutes. The PhD in Civil Engineering prepares students for research and teaching careers in civil engineering, including higher education, private foundations, and state, local, or Federal government agencies.

REQUIREMENTS

The MS and the PhD requirements in Civil Engineering / Transportation and Urban Engineering conform to The Graduate School requirements laid out above. The specific requirements for coursework and research are described below.

MS PLAN A REQUIREMENTS

A total of 30 credits are required for graduation, with a minimum of 21 credits of coursework in Civil Engineering or related area and a minimum of 9 credits of Master's Thesis Research (GRAD 5950). A student may enroll in GRAD 5950 credits at any time during the M.S. degree and it is the student's responsibility to coordinate with the research advisor (and secondarily, with the research committee) on the research plan and requirements for graduation. All MS Plan A students in the Transportation and Urban Engineering area of Concentration are required to take courses as follows:

- CE 5710 Case Studies in Transportation Engineering (3 credits)
- Two of the following four courses (6 credits):
    - CE 5720 Street and Highway Design
    - CE 5730 Transportation Planning
    - CE 5740 Traffic Engineering Characteristics
    - CE 5750 Pavement Design
- One or more courses in Civil Engineering in the Transportation and Urban Engineering specialization (minimum 3 credits)
- Two or more courses outside of Civil Engineering / Transportation and Urban Engineering (minimum 6 credits)
- If the student's prior degrees are in an area other than civil engineering, the following background preparation courses are required if not previously taken:
    - CE 2251 Probability and Statistics in Civil and Environmental Engineering
    - CE 2211 Engineering Economics

    - CE 2710 Transportation Engineering
    - MATH 2110Q Multivariable calculus
- Students must register for and attend CE 5030 Seminar in Transportation and Urban Engineering every semester in which they are either enrolled full time or supported by a graduate assistantship.

The remaining courses may be selected in consultation with the advisor.

A Plan A MS requires the submission of an MS Thesis, in the form of a submission-ready paper manuscript, and an oral defense for graduation. The oral defense fulfills the role of the final examination for the MS degree. The scope, content and length of the MS thesis results from the agreement between the research advisor and the student. An advisory committee of at least two additional faculty members will also evaluate the originality and quality of the thesis prior to graduation. In general, the thesis should present the methodology and results of novel, independent research conducted by the student. Thus, Plan A MS theses cannot be solely literature reviews or replicate research already published in the scientific literature. As a standard, the MS thesis should constitute the basis for a journal paper submission and may be structured as such.

MS PLAN B REQUIREMENTS

A total of 30 credits are required for Plan B Master's, with a minimum of 30 credits of coursework in Civil Engineering or related area, including 3 credits as a practice-oriented project taken as CE 5020 Graduate Independent Study in Civil Engineering. All MS Plan B students in the Transportation and Urban Engineering area of Concentration are required to take courses as follows:

- CE 5710 Case Studies in Transportation Engineering (3 credits)
- Three of the following four courses (9 credits):
    - CE 5720 Street and Highway Design
    - CE 5730 Transportation Planning
    - CE 5740 Traffic Engineering Characteristics
    - CE 5750 Pavement Design
- Two or more courses in Civil Engineering in the Transportation and Urban Engineering specialization (minimum 6 credits)
- Two or more courses outside of Civil Engineering / Transportation and Urban Engineering (minimum 6 credits)
- If the student's prior degrees are in an area other than transportation, the following background preparation courses are required if not previously taken:

    - CE 2251 Probability and Statistics in Civil and Environmental Engineering
    - CE 2211 Engineering Economics
    - CE 2710 Transportation Engineering
    - MATH 2110Q Multivariable calculus
- Students must register for and attend CE 5030 Seminar in Transportation and Urban Engineering every semester in which they are either enrolled full time or supported by a graduate assistantship.

The remaining courses may be selected in consultation with the advisor.

The final examination (oral exam) consists of an oral presentation of the CE 5020 final master's project to a faculty examination committee, followed by questions from the committee. The project report must be delivered to the examination committee two weeks before the date of the final examination.

PHD REQUIREMENTS

Coursework

If a student is admitted to the PhD program with only a BS degree, at least 30 credits of coursework are required. If the student has a MS degree, the minimum requirement is 15 credits. All PhD students are required to take or demonstrate proficiency in the following courses prior to taking the General Exam:

- CE 5710 Case Studies in Transportation Engineering
- Three of the following four courses:
    - CE 5720 Street and Highway Design
    - CE 5730 Transportation Planning
    - CE 5740 Traffic Engineering Characteristics
    - CE 5750 Pavement Design
- If the student's prior degrees are in an area other than transportation, the following background preparation courses are required if not previously taken:
    - CE 2251 Probability and Statistics in Civil and Environmental Engineering
    - CE 2211 Engineering Economics
    - CE 2710 Transportation Engineering
    - MATH 2110Q Multivariable calculus

- Students must register for and attend CE 5030 Seminar in Transportation and Urban Engineering every semester in which they are either enrolled full time or supported by a graduate assistantship.

The advisory committee may substitute the above with equivalent courses. The remaining credits may be taken in one of the three areas of concentration with courses selected in consultation with the advisory committee.

Steps for Graduation

There are five steps to graduation as outlined below. Please note that these represent specific requirements in addition to Graduate School and Civil Engineering program requirements.

1. Plan of Study

- For a student admitted to the PhD program with a previously earned MS, the POS must be filed within the first 2 semesters (or before completion of 12 credits of coursework)
- For a student admitted to the PhD program without a previously earned MS, the POS must be filed within the first 4 semesters (or before completion of 18 credits of coursework)

2. General Exam

In addition to the requirements established by the CEE department, students enrolled in the TUE concentration area must complete all course requirements before the general exam can be taken. The TUE faculty administer the exam on request by a student, annually in May, typically the week following the final exam week.

The General Examination for TUE is given in three parts:

- First, a written exam testing the student on TUE fundamentals. The written portion of the exam consists of four questions, one each from the three selected Transportation Core courses, and one from the area of emphasis outside of CE/Transportation. The exam is generally 3 to 4 hours long and each part may be open or closed book according to the examiner's decision.
- Second, a take home exam that evaluates the student's ability to carry out independent research in the field of study. Each student will be assigned an open-ended problem in an area closely aligned with the student's potential dissertation topic. As part of the narrative, the student is expected to formulate a hypothesis, carry out a literature review, describe a study approach, identify analysis techniques, and discuss potential results. The student would have two days to complete this take home exam.
- Third, an oral presentation presenting the student's solution to the open-ended problem assigned in the second part of the general exam. In the oral portion, the student makes a 20-minute presentation of the response and answers questions about this proposal (part 2 of the general exam) and the answers to the written questions (part 1 of the general exam).

The timing of the three parts is as follows:

- One week before the written portion is administered; the examiners announce whether each part will be open or closed book.
- The independent research problem is assigned on the day of the written exam. The student is expected to submit a response within two days.
- The oral presentation will be held, within a week after the independent research problem response is due.

3. Dissertation Research Proposal Defense

- There are two parts to this step. First, the student must submit a proposal narrative. Second, the student must present their proposal by making an oral presentation.
- The research proposal is usually a draft of the student's dissertation prospectus. The dissertation prospectus is a document that outlines the proposed research for the dissertation and has to be compiled and approved before the research is well underway.
- In addition to the proposal narrative, the student is also expected to present their proposal to the advising committee. In the oral portion, the student makes a 20-minute presentation of the research proposal and answers questions about this proposal.
- It is recommended that the dissertation proposal is submitted for approval in the semester after a student passes the General Exam, but the maximum time is one year after passing the General Exam.

4. Publications

In addition to Graduate School requirements, the Civil Engineering Program requires that a PhD student must prepare three journal papers: At least 1 published or in press, 1 accepted and 1 submitted for journal publication. However, it is important that the three papers address a larger, coherent research question (as outlined in the Dissertation Proposal above) and that they are not isolated bodies of work.

5. Dissertation Defense

- This last step also consists of two parts. First, the student must submit a written dissertation. Second, the student presents the dissertation work by making an oral presentation
- For the written dissertation, the three papers can be woven together with introduction and conclusion sections to submit as an integrated PhD dissertation. The PhD dissertation must be submitted to the advisory committee 14 days prior to the date of the defense.
- The dissertation defense can be scheduled a minimum of 6 months after the proposal defense. First the student must complete and submit the CEE PhD Checklist Form. Once the Checklist Form has been submitted, the student may work with CEE Department staff to find a room and time for the defense.