

# Civil Engineering

The Department of Civil and Environmental Engineering offers graduate courses and research opportunities for students seeking an M.S. or Ph.D. through the Civil Engineering field of study. An MS degree awarded in Civil Engineering may be either research-based (Plan A) or coursework-based (Plan B). Plan A students often pursue PhD studies or careers in research and development in government and private institutes. Areas of concentration within Civil Engineering include applied mechanics (Ph.D. only), environmental engineering (M.S. only), geotechnical engineering, structural engineering and transportation and urban engineering.

## **GENERAL REQUIREMENTS**

The MS and the PhD requirements in Civil Engineering conform to Graduate School requirements. The specific requirements for coursework and research are described below. The PhD in Civil Engineering does not have a related area or foreign language requirement, unless one is specified by the advisory committee. All M.S. and Ph.D. students have to maintain a GPA of 3.0 to maintain their status in the program. Failure to meet this standard triggers a probationary of period of one semester, after which the student is subject to dismissal.

## **M.S. PLAN A REQUIREMENTS**

A total of 30 credits are required for graduation, with a minimum of 21 credits of coursework 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 their responsibility to coordinate with their research advisor (and secondarily, with their research committee) on the research plan and requirements for graduation.

A Plan A M.S. requires the submission of an M.S. 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 M.S. degree. The scope, content and length of the M.S. thesis results from the agreement between the research advisor and the student. An advisory committee of at least two additional faculty members will also weigh in on 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 M.S. theses cannot be solely literature reviews or replicate research already published in the scientific literature. As a standard, the M.S. thesis should constitute the basis for a journal paper submission and may be structured as such.

Additional requirements of individual areas of concentration are noted below.

## **Environmental Engineering**

The Environmental Engineering concentration conforms to the guidelines of the Environmental Engineering Field of Study (<http://gradcatalog.uconn.edu/fields-of-study/environmental-engineering/>). All MS students are required to take the following core courses:

- ENVE 5310 Environmental Transport Phenomena
- ENVE 5320 Quantitative Methods for Engineers

The remaining courses may be related to one of the three areas of concentration (atmospheric processes, hydrogeosciences and water resources management, and contaminant fate and resource recovery) in consultation with the advisor.

## **Geotechnical Engineering**

To earn the M.S. Plan A degree in Geotechnical Engineering, all students must have completed five of the following eight courses:

- CE 5541 Advanced Soil Mechanics
- CE 5542 Earthquake Engineering
- CE 5543 Advanced Foundation Design
- CE 5530 Geoenvironmental Engineering
- ENVE 5830 Groundwater Flow Modeling
- ENVE 5821 Vadose Zone Hydrology
- CE 5122 Advanced Mechanics of Materials
- CE 5164 Finite Elements I

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

## **Structural Engineering**

To earn the M.S. Plan A degree in Structural Engineering, all students must:

- Have completed a minimum of 21 credits of advanced coursework, of which at least 18 credits must be at the graduate level.
- Completed three core courses:
  - CE 5122 (Advanced Mechanics of Materials),
  - CE 5164 (Finite Elements I), and
  - CE 5610 (Advanced Reinforced Concrete Structures) or CE 5620 (Advanced Steel Structures).
- No more than 3 credits may be taken as independent study.

## **Transportation and Urban Engineering**

To earn the M.S. Plan A degree in Transportation and Urban Engineering, all students must have completed:

- 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 with a focus on transportation (or equivalent), the following background preparation courses are required if not previously taken:
  - CE 2251 Probability and Statistics in CEE
  - 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 for 9 or more credits or supported by a graduate assistantship.
- The remaining courses may be selected in consultation with the advisor.

## **M.S. PLAN B REQUIREMENTS**

A total of 30 credits are required for plan B Master's, with a minimum of 27 credits of coursework in Civil Engineering or a related area. The remaining credits may be used towards a research project as CE 5020: Independent Graduate Study in Civil Engineering or ENVE 5020 Graduate Independent Study in Environmental Engineering for the Environmental Engineering concentration.

Additional requirements of individual areas of concentration are noted below.

## **Environmental Engineering**

The Environmental Engineering concentration conforms to the guidelines of the Environmental Engineering Field of Study. A minimum of 27 credits of coursework is required in Environmental Engineering or related area. The remaining credits may be used towards additional courses or towards a research project as Graduate Independent Study in Environmental Engineering (ENVE 5020). All MS students are required to take the following core courses:

- ENVE 5310 Environmental Transport Phenomena
- ENVE 5320 Quantitative Methods for Engineers

The remaining courses may be related to one of the three areas of concentration (atmospheric processes, hydrogeosciences and water resources management, and contaminant fate and resource recovery) in consultation with the advisor.

The final examination for a plan B Master's is an oral or written exam on three core courses of Environmental Engineering: ENVE 5310 and two additional ENVE courses selected by the student. The exam will take place in the final semester before graduation and it will be administered by the advisory committee that will sign the Plan of Study and the Report on the Final Examination

### **Geotechnical Engineering**

To earn the M.S. Plan A degree in Geotechnical Engineering, all students must have completed five of the following eight courses:

- CE 5541 Advanced Soil Mechanics
- CE 5542 Earthquake Engineering
- CE 5543 Advanced Foundation Design
- CE 5530 Geoenvironmental Engineering
- ENVE 5830 Groundwater Flow Modeling
- ENVE 5821 Vadose Zone Hydrology
- CE 5122 Advanced Mechanics of Materials
- CE 5164 Finite Elements I

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

### **Structural Engineering**

To earn the M.S. Plan B degree in Structural Engineering, all students must have completed:

- Three core courses:
  - CE 5122 (Advanced Mechanics of Materials),
  - CE 5164 (Finite Elements I), and
  - CE 5610 (Advanced Reinforced Concrete Structures) or CE 5620 (Advanced Steel Structures).
- Three credits of CE 5020: Independent Graduate Study in Civil Engineering used toward the execution of a research project.

### **Transportation and Urban Engineering**

To earn the M.S. Plan B degree in Transportation and Urban Engineering, all students must have completed:

- 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 transportation, the following background preparation courses are required if not previously taken:
  - CE 2251 Probability and Statistics in CEE
  - 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 for 9 or more credits or supported by a graduate assistantship.
- Three credits of CE 5020: Independent Graduate Study in Civil Engineering used toward the execution of a research project.
- The remaining courses may be selected in consultation with the advisor.

## **PH.D. REQUIREMENTS**

### **Coursework**

If a student is admitted to the Ph.D. program with only a B.S. degree, at least 30 credits of coursework are required. If the student has a M.S. degree, the minimum requirement is 15 credits. Students are also required to complete at least 15 credits of GRAD 6950 in addition to coursework requirements.

Additional requirements of individual areas of concentration are noted below.

### **Applied Mechanics**

In addition to the general requirements of the Graduate School as outlined in the Graduate School Catalog, each student must meet the requirements described below as well as complete and successfully defend a dissertation to earn the Applied Mechanics Ph.D.

- Have completed a minimum of 45 credit hours in post-baccalaureate coursework.
- Completed three core courses:
  - CE 5122 (Advanced Mechanics of Materials),
  - CE 5164 (Finite Elements I), and
  - CE 5610 (Advanced Reinforced Concrete Structures) or CE 5620 (Advanced Steel Structures).
- No more than 3 credits may be taken as independent study.

### **Structural Engineering**

To earn the Ph.D. degree in Structural Engineering, all students must have completed:

- A minimum of 45 credit hours in post-baccalaureate coursework.
- Three core courses:

- CE 5122 (Advanced Mechanics of Materials),
- CE 5164 (Finite Elements I), and
- CE 5610 (Advanced Reinforced Concrete Structures) or CE 5620 (Advanced Steel Structures).
- No more than 3 credits may be taken as independent study.

### **Transportation and Urban Engineering**

To earn the Ph.D. degree in Transportation and Urban Engineering, all students must have completed:

- 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 transportation, the following background preparation courses are required if not previously taken:
  - CE 2251 Probability and Statistics in CEE
  - 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 for 9 or more credits 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.

### **General Examination**

The General Exam is taken after the student has completed at least 12 credits of coursework (with a M.S.) or 18 credits of coursework (with a B.S.). An approved Plan of Study must be filed with the Graduate School before the general exam can be taken. The Civil Engineering field of study administers the General Exam as an oral and written examination to test student mastery of core concepts appropriate to the areas of concentration and student ability to integrate concepts across disciplinary areas.

### **Dissertation Proposal**

The dissertation proposal is a document that outlines the proposed research for the dissertation and has to be compiled and approved before the research is well underway. It is recommended that the dissertation proposal is submitted for approval in the semester following a student

successfully passing their General Exam and should be submitted no more than one year after the General Exam.

### **Candidacy, Dissertation Preparation, and Final Oral Defense**

In addition to Graduate School requirements, the Civil Engineering field of study requires that a Ph.D. student must have three journal papers: one published or accepted for publication, one under review and one in the final stages of preparation. However, it is important that the three papers address a larger, coherent research question (as outlined in the Dissertation Proposal) and are not isolated bodies of work.