

CIVIL ENGINEERING, PH.D.

All programs of study must be approved by the student's academic advisor and the Department of Civil and Environmental Engineering graduate director.

Learning Outcomes

- Graduates will be able to demonstrate expertise in a core subject area of civil and environmental engineering.
- Graduates will be able to demonstrate a working knowledge of various areas of CEE and related fields.
- Students will be able to describe and discuss sound research approaches and knowledge of advances in Civil and Environmental Engineering.
- Students will be able to demonstrate the ability to apply knowledge of mathematics, science and engineering.
- Graduates will be able to identify pertinent research problems, to formulate and execute a research plan.
- Graduates will be able to describe and discuss advances of knowledge in civil and environmental engineering.
- Graduates will be able to generate and analyze original research results, and to communicate these results through oral presentations and written publications submitted to refereed archival journals.
- Graduates will demonstrate the basic skills needed for life-long learning and professional development.

Admissions

Students should have the equivalent of an M.E. or M.S. degree in civil engineering or closely related engineering field. Exceptional students may be eligible to enter directly the Ph.D. degree program with a B.S. degree in civil engineering or closely related engineering field. Applicants must generally exceed the minimum grade point average and test score requirements listed for the M.S. degree program. Outstanding students with non-engineering baccalaureate degrees may qualify for admission to the Ph.D. degree program, with the understanding that they must complete specified deficiency/prerequisite courses.

Degree Requirements (60 Post-Baccalaureate Hours)

Completion of the doctoral degree requires a minimum of 60 credits beyond the baccalaureate degree, of which 12 must be ECIV 899. Students having an earned M.S. or M.E. degree must complete a minimum of 30 credit hours beyond the master's degree. At least half of the course work must be completed at the 700 level or higher. Prescribed core courses are required for each area of study (see "Core Courses" below).

For students pursuing a Ph.D. degree in the same program area as their M.S. or M.E. degree, a minimum of 18 credit hours of course work is required. Core courses may be satisfied during the M.S. or M.E. degree. For students pursuing a Ph.D. degree in a different program area from their M.S. or M.E. degree, a minimum of 24 credit hours of course work in the new area is required. "Program area" refers to environmental, geotechnical, structural, transportation or water resources engineering.

Credits earned in ECIV 798 do not count toward a student's program of study.

The residency requirement for the Ph.D. degree ensures that students benefit from and contribute to the complete spectrum of educational and professional opportunities provided by the graduate faculty of a comprehensive university. The granting of a doctoral degree presupposes a minimum of three full years of graduate study following admission to the doctoral program. As such, the residency requirement may be fulfilled by enrollment in at least 18 graduate credit hours within a span of three consecutive semesters (excluding summers). Enrollment in a summer term is not required to maintain continuity, but credits earned during summer terms may be used to count toward residency. Enrollment through the APOGEE program does not satisfy the residency requirement for the Ph.D. degree.

Core Courses

Each area of study has a minimum core requirement for the M.S., M.E., and Ph.D. degrees. The core requirements in the different areas of study are as follows:

Environmental Engineering

Course	Title	Credits
ECIV 750	Principles of Environmental Engineering Process	3
Select two of the following:		6
ECIV 555	Principles of Municipal Solid Waste Engineering	
ECIV 556	Air Pollution Control Engineering	
ECIV 558	Environmental Engineering Process Modeling	
ECIV 751	Water and Wastewater Treatment Theory I	
ECIV 752	Water and Wastewater Treatment Theory II	
ECIV 753	Unit Operations Laboratory for Water and Wastewater Treatment	
ECIV 755	Industrial Wastewater Treatment	
Total Credit Hours		9

Geotechnical Engineering

Course	Title	Credits
ECIV 730	Advanced Soil Mechanics	3
Select three of the following:		9
ECIV 731	Slope Stability, Retaining Systems and Lateral Earth Pressure	
ECIV 732	Theoretical and Numerical Methods in Geomechanics	
ECIV 733	Physico-chemical Properties of Soils	
ECIV 734	Dynamics of Soils and Foundations	
ECIV 736	Ground Improvement Techniques	
ECIV 737	Advanced Foundation Design	
Total Credit Hours		12

Structural Engineering

Course	Title	Credits
ECIV 720	Advanced Structural Mechanics and Analysis	3
Select three of the following:		9
ECIV 722	Theory and Design of Plates and Shells	
ECIV 724	Dynamics of Structures	
ECIV 725	Advanced Analysis and Design in Structural Metals	
ECIV 726	Repair and Retrofit of Structures	
ECIV 727	Advanced Analysis and Design of Reinforced Concrete	
ECIV 728	Prestressed Concrete Analysis and Design	

ECIV 737 Advanced Foundation Design

Total Credit Hours 12**Transportation Engineering**

Course	Title	Credits
--------	-------	---------

Select one from each group: 9

Group One

ECIV 535 Geotechnical Engineering in Transportation

ECIV 540 Transportation Systems Planning

ECIV 541 Highway Design

Group Two

ECIV 542 Traffic Engineering

ECIV 748 Traffic Flow Theory

Group Three

ECIV 705 Deterministic Civil and Environmental Systems Engineering

ECIV 706 Probabilistic Civil and Environmental Systems Engineering

Total Credit Hours 9**Water Resources Engineering**

Course	Title	Credits
--------	-------	---------

Select one of the following options: 9

Option One

Select two of the following:

ECIV 760 Computational Hydraulics

ECIV 761 Numerical Methods in Subsurface Hydrology

ECIV 762 Advanced Hydrology

ECIV 763 Unsaturated Flow Theory

ECIV 764 Contaminant Transport

ECIV 765 Erosion and Sediment Control

ECIV 766 Fluid Transients

ECIV 767 Sediment Transport and River Mechanics

Select one of the following:

ECIV 560 Open Channel Hydraulics

ECIV 562 Engineering Hydrology

ECIV 563 Subsurface Hydrology

Option Two

Select three of the following:

ECIV 760 Computational Hydraulics

ECIV 761 Numerical Methods in Subsurface Hydrology

ECIV 762 Advanced Hydrology

ECIV 763 Unsaturated Flow Theory

ECIV 764 Contaminant Transport

ECIV 765 Erosion and Sediment Control

ECIV 766 Fluid Transients

ECIV 767 Sediment Transport and River Mechanics

Total Credit Hours 9