

CIVIL ENGINEERING, M.S.

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

1. Graduates will be able to demonstrate expertise in a core subject area of civil and environmental engineering.
2. Graduates will demonstrate a working knowledge of various areas of civil and environmental engineering and in related fields, including other engineering disciplines, the sciences, and mathematics.
3. Graduates will be able to describe and discuss advances of knowledge in civil and environmental engineering.
4. Students will be able to apply knowledge of mathematics, science and engineering.
5. Graduates will demonstrate the basic skills (e.g., leadership, presentation, time managements, problem solving, study, and organizing) required for life-long learning and professional development.

Admissions

Students with Bachelor of Science (B.S.) degrees in civil or environmental engineering are eligible to enter the M.S. degree program. Students with engineering degrees in areas other than civil engineering may be required to complete deficiency/prerequisite undergraduate courses. As a minimum, the following deficiency/prerequisite courses or equivalent will be required: MATH 141, MATH 142 and MATH 242; CHEM 111; PHYS 211 and PHYS 212; ECIV 200; ECIV 201; STAT 509. Students will also be required to take all undergraduate courses that are listed as prerequisites for courses taken for graduate credit. In general, deficiency/prerequisite courses must be completed with a **B** average. Specific Program Areas may require additional course work.

An undergraduate grade point average (GPA) of 2.8 on a 4.0 scale, and 3.0 on a 4.0 scale on any graduate course work is required for students wishing to enter the M.S. degree programs with B.S. degrees in engineering. Exceptions to the minimum undergraduate GPA requirements for admission to the M.S. degree program may be made for students with special qualifications.

For students with non-engineering baccalaureate degrees, or engineering degrees from programs not accredited by ABET, the minimum grade requirement is a GPA of 3.0 on a 4.0 scale on their undergraduate coursework, and 3.0 on a 4.0 scale on any graduate course work.

The general Graduate Record Examination (GRE) is not required for students entering the M.S. degree program providing the student has a GPA of 3.4 or higher and a B.S. degree in civil or environmental engineering or closely related field from an ABET-accredited program. The GRE is required for applicants not meeting these requirements. Typically, successful applicants have combined scores of at least 301 (1100 in the old scale) on the Verbal and Quantitative (V + Q) sections, 160 on the Q section, and 3.5 on the Analytical Writing (A) section.

Degree Requirements (30 Hours)

For the M.S. degree, 30 credit hours, of which 6 credit hours must be ECIV 799, are required. At least 12 hours of course work must be 700-level or higher. Up to 12 credit hours of course work may be taken outside of the department for degree credit with the approval of the student's

advisor and the graduate director. Prescribed core courses are required for each area of study (see "Core Courses" below). A maximum of 6 credits of ECIV 797 may be used toward the student's program of study.

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

Core Courses

Each area of specialization has specific graduate core course requirements that are presented in the tables below. These requirements are designed to provide opportunities for cross-disciplinary programs of study that require breadth and flexibility beyond classical courses offered for a given area of specialization, and that may better reflect the student's personal research and career interests. This can be achieved by allowing to substitute one additional core course with any USC graduate (500-level or higher) course, subject to the approval of the student's advisor and ECIV graduate director through the program of study (MPOS) form.

Environmental Engineering (12 hours)

Course	Title	Credits
ECIV 750	Principles of Environmental Engineering Process	3
Select three of the following:		9
ECIV 502	Life Cycle Assessment of Engineered Systems	
ECIV 555	Principles of Municipal Solid Waste Engineering	
ECIV 556	Air Pollution Control Engineering	
ECIV 558	Environmental Engineering Process Modeling	
ECIV 590	Intermediate Special Topics *	
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	
ECIV 790	Selected Topics in Civil Engineering *	
Select one USC graduate (500-level or higher) course *		
Total Credit Hours		12

* To be approved by student's advisor and ECIV graduate director through program of study (MPOS) form.

Geotechnical Engineering (12 hours)

Course	Title	Credits
ECIV 730	Advanced Soil Mechanics	3
Select three of the following:		9
ECIV 590	Intermediate Special Topics *	
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	Soil Dynamics and Geotechnical Earthquake Engineering	
ECIV 736	Ground Improvement Techniques	
ECIV 737	Advanced Foundation Design	
ECIV 790	Selected Topics in Civil Engineering *	
Select one USC graduate (500-level or higher) course *		
Total Credit Hours		12

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Railway Engineering (12 hours)

Course	Title	Credits
Select two of the following "Fundamental" core courses:		6
ECIV 580	Railway Engineering I	
ECIV 582	Operation and Logistics of Railway Systems	
ECIV 588	Design of Railway Bridges and Structures	
ECIV 590	Intermediate Special Topics *	
Select one "Advanced" core course **		
Select one "Advanced" or "Cross-Disciplinary" core course **		
Select one of the following "Advanced" core courses:		3
ECIV 707	Management of Engineering Projects	
ECIV 724	Dynamics of Structures	
ECIV 734	Soil Dynamics and Geotechnical Earthquake Engineering	
ECIV 784	Dynamic Analysis of Railway Systems	
ECIV 789	Design Project in Railway Engineering	
ECIV 790	Selected Topics in Civil Engineering *	
Select one of the following "Cross-Disciplinary" core courses:		3
Select of one Geotechnical Engineering core course		
Select one Environmental Engineering core course		
Select one Structural Engineering core course		
Select one Transportation Engineering core course		
Select one Water Resources Engineering core course		
Select one USC graduate (500-level or higher) course *		
Total Credit Hours		12

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** Applies to PhD students with MS/ME degree only. May be taken for either "Fundamental" core course credit, or "Advanced" or "Cross-Disciplinary" core course credit, not both.

Structural Engineering (12 hours)

Course	Title	Credits
ECIV 720	Advanced Structural Mechanics and Analysis	3
Select three of the following:		9
ECIV 590	Intermediate Special Topics *	
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	
ECIV 790	Selected Topics in Civil Engineering *	
Select one USC graduate (500-level or higher) course *		
Total Credit Hours		12

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Transportation Engineering (12 hours)

Course	Title	Credits
Select one of the following:		3
ECIV 535	Geotechnical Engineering in Transportation	
ECIV 540	Transportation Systems Planning	
ECIV 541	Highway Design	
Select one of the following:		3
ECIV 542	Traffic Engineering	
ECIV 748	Traffic Flow Theory	
Select one of the following:		3
ECIV 705	Deterministic Civil and Environmental Systems Engineering	
ECIV 706	Probabilistic Civil and Environmental Systems Engineering	
Select one of the following:		3
ECIV 590	Intermediate Special Topics *	
ECIV 790	Selected Topics in Civil Engineering *	
Select one USC graduate (500-level or higher) course *		
Total Credit Hours		12

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Water Resources Engineering (12 hours)

Course	Title	Credits
Select up to one of the following:		0-3
ECIV 560	Open Channel Hydraulics	
ECIV 562	Engineering Hydrology	
ECIV 563	Subsurface Hydrology	
ECIV 590	Intermediate Special Topics *	
Select at least two of the following:		6-12
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	
ECIV 790	Selected Topics in Civil Engineering *	
Select up to one of the following:		0-3
Select one USC graduate (500-level or higher) course *		
Total Credit Hours		12

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