

# Civil and Environmental Engineering, Ph.D.

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The Ph.D. indicates attainment of an original and significant research contribution to the state-of-the-art in the candidate's field, and an ability to communicate advanced engineering concepts. The doctoral program is tailored to the individual needs and background of the student. The detailed program of study for each Ph.D. student is formulated in consultation with a faculty advisor who takes into consideration the objectives and preparation of the candidate. The program of study must be approved by the faculty advisor and the Graduate Advisor of the Department.

Students applying to the Ph.D. program are admitted based on their qualifications and availability of funding. Ph.D. applicants must submit three letters of recommendation. Detailed program information is available on the Department of Civil and Environmental Engineering website (<https://engineering.uci.edu/dept/cee/academics/graduate/>).

The Ph.D. dissertation is written documentation of original research that has impact on the chosen field of study. For the UCI Samueli School of Engineering, impact in the field is measured by accepted or published peer-reviewed journal articles, peer-reviewed conference proceedings, patents, or analogous evidence of original, significant, and independent contribution to the state of the art in the field as assessed by the approved dissertation committee.

There are no specific course requirements. Within this flexible framework, the School maintains specific guidelines that outline the milestones of a typical doctoral program. All doctoral students should consult the Civil and Environmental Engineering program's guidelines for details, but there are several milestones to be passed: admission to the Ph.D. program by the faculty; early assessment of the student's research potential (this includes a preliminary examination); research preparation; formal advancement to candidacy by passing the qualifying examination in the third year (second year for students who entered with a master's degree); completion of a significant research investigation; and the submission and oral defense of an acceptable dissertation. There is no foreign language requirement. Ph.D. students have to meet departmental research requirements as a research assistant or equivalent, with or without salary. The degree is granted upon the recommendation of the Doctoral Committee and the Dean of Graduate Studies. The normative time for completion of the Ph.D. is five years (four years for students who entered with a master's degree). The maximum time permitted is seven years.

At the point of application a student is required to choose one of four focus areas: Structures, Geotechnics and Materials; Transportation Systems; Hydrology and Water Resources Systems; or Environmental and Energy Systems. Once admitted, each student will be assigned to an advisor from among active faculty in their focus area. Financial support through research or teaching assistantships and a variety of fellowships and scholarships is available to qualified students and highly competitive. Interdisciplinary study in one or more areas outside of the student's primary focus area is strongly encouraged.

## **Structures, Geotechnics, and Materials**

This area emphasizes the application of analytical, numerical, experimental, and practical approaches to the investigation of built infrastructure systems that withstand natural and man-made loads and hazards. Specific interests include sensors and structural health monitoring, composites for infrastructure applications, reliability and risk assessment of civil engineering systems, structural control, system identification and damage detection, performance-based earthquake engineering, soil-structure interaction, smart materials and structures, multi-scale modeling, and sustainable green materials and infrastructural systems.

## **Transportation Systems**

Among leading centers for transportation research, the department offers a graduate research area that is distinguished by its interdisciplinary approach to the study of current and emerging urban transportation issues and through its partnership with the UC Irvine Institute of Transportation Studies. This area focuses on the planning, design, operation, and management of complex transportation systems. Emphasis is on the development of fundamental knowledge in engineering, systems analysis, modeling, and planning, combined with advanced computational techniques and information technologies, to address transportation problems affecting urban travel and goods movement.

## **Hydrology and Water Resources Systems**

Developing sustainable water supplies while preserving natural resources and the environment is a grand challenge in the 21st century requiring interdisciplinary thinking and engineering solutions. This area focuses on fundamentals and the use of mathematical, computational, and experimental approaches to understanding the dynamics of the hydrologic cycle, transport within aquatic systems, and the impact of human activity, particularly in urban areas. Specific areas include water resources planning, remote sensing of the environment, water-related hazards such as floods and droughts, and transport in land, oceans, and the atmosphere.

## **Environmental and Energy Systems**

Treatment, distribution, and collection of water and wastewater are energy intensive operations, and energy generation and distribution have direct and indirect impacts on environmental systems. This area addresses these interrelated challenges by focusing on the treatment and supply of water for municipal, agricultural, energy, and environmental uses, sustainable practices for managing urban stormwater, and chemical and microbiological processes for water treatment. Additionally, novel approaches for energy generation and distribution are covered in this area. Understanding and minimizing emissions of greenhouse gasses associated with water and wastewater treatment and energy generation and distribution are common themes in this area.