CIVIL AND ENVIRONMENTAL ENGINEERING (PHD)

Graduate School

Program Website (https://www.engineering.cornell.edu/cee/phd-program/)

CIP: 14.0801 | **HEGIS:** 0908.00 | **NYSED:** 14381

Graduate Field

Civil and Environmental Engineering (https://catalog.cornell.edu/graduate-school/civil-environmental-engineering/)

Program Description

The Graduate field of Civil and Environmental Engineering is an interdisciplinary program that covers an extensive field bound within the context of public works and service. The research conducted in CEE benefits the public good and is at the cutting edge of technological and scientific developments. Students in the Ph.D. program may select one area of concentration. Additional information on the Ph.D. programs are available on request from the graduate field office.

Concentrations

Complex Systems Engineering

Complex Systems Engineering investigates how systems-level behavior emerges from interactions among components in both engineered and natural systems. This inherently interdisciplinary field combines mathematical modeling, nonlinear dynamics, data science, numerical simulation, optimization, and stochastic processes with domain-specific knowledge grounded in physical, chemical, and biological principles. Research in this area spans a wide range of applications, including cyber-physical systems, environmental fluids, microbial communities, renewable energy, synthetic biology, transportation systems, infrastructure, and power networks.

Environmental Processes

Environmental Processes is concerned with the protection and management of the quality of the environment for the benefit of society. Degree programs emphasize biological, chemical, and physical phenomena and engineering principles; laboratory and computational skills; and their application to the analysis of relevant problems. The field focuses on advancing fundamental knowledge and developing sustainable technologies that can contribute to the paradigm shifts needed to face the most urgent environmental challenges facing human societies.

Environmental Fluid Mechanics and Hydrology

Environmental Fluid Mechanics and Hydrology involves the study of fluid mechanics of the environment and the associated application to hydraulics, hydrology, coastal oceanography, and meteorology as related to the wet earth and atmosphere. Research in this area includes: air-sea interaction; hydrodynamics and sediment transport; wave-structure interactions; numerical modeling of tsunami generation; remote sensing techniques for sea states; water properties and seafloor characterization.

Environmental and Water Resources Systems Engineering

Research and instruction in this area address the development and application of scientific principles, economic theory, and mathematical techniques to the management and planning of public infrastructure and environmental and water resource systems. Research projects include evaluation of engineering projects, groundwater contaminant modeling and remediation optimization, statistical analysis of hydrologic processes, hydropower systems optimization, water supply systems management, water quality planning, remote sensing, risk analysis, river basin, and groundwater systems planning and operation, ecological systems management, sustainable development, and computer graphics-oriented decision support systems.

Structural Engineering

Structural Engineering concentrates its considerable expertise in materials, computational and probabilistic mechanics, structural health monitoring, and high-performance computing to model, analyze, simulate, and design complex systems that are characterized by multi-physics processes that transcend several time and length scales. The group also seeks to establish a reciprocal relationship between experimentation and computing by utilizing physical experiments to observe behavior phenomena, to measure properties and mechanisms, and to validate computational models.

Transportation Systems Engineering

Transportation Systems Engineering embraces policy, planning, design, and evaluation of transport systems and the relationships among transport supply and demand, land use, and regional development. The approach is multimodal and systems-oriented; it emphasizes the use of quantitative and analytical techniques of operations research and economics. Research in the field consists of automated traveler information systems, freight transportation and security concerns, transportation of hazardous materials, and air quality issues in urban transportation.

Program Information

- Instruction Mode: In Person
- Location: Ithaca, NY
- Minimum Credits for Degree: 90

Program Requirements

- 18 credits of graded graduate level coursework required
- Minimum Semesters for Degree: 6

Graduate School Milestones

- Responsible Conduct of Research Training: Required
- Open Researcher and Contributor ID (ORCID): Required
- Student Progress Reviews (SPR) begin: First Year
- Examination for admission to candidacy (A Exam): subject to student and faculty timeline
- Defense of Dissertation (B Exam): subject to student and faculty timeline
- Dissertation: subject to student and faculty timeline

Field Specific Milestones

Qualifying Exam (Q Exam): End of the first year for most concentrations, must be taken at the end of the third semester. Course credit requirement

for exam (in progress/ complete)- if taken second semester: nine (9) course credits; third semester: twelve (12) course credits.

Course Requirements

18 credits of graded graduate level coursework required. Additional course requirements may be set by the student's Special Committee. Program specific requirements that apply to all students are included below.

Year 1

- CEE 5025 Civil and Environmental Engineering Seminar for First-Year Research Students (Two enrollments)
- Coursework dictated by committee chair and special committee

Year 2

- Coursework dictated by committee chair and special committee

University Graduation Requirements Requirements for All Students

In order to receive a Cornell degree, a student must satisfy academic and non-academic requirements.

Academic Requirements

A student's college determines degree requirements such as residency, number of credits, distribution of credits, and grade averages. It is the student's responsibility to be aware of the specific major, degree, distribution, college, and graduation requirements for completing their chosen program of study. See the individual requirements listed by each college or school or contact the college registrar's office (https://registrar.cornell.edu/service-resources/college-registrar-directory/) for more information.

Non-academic Requirements

Conduct Matters. Students must satisfy any outstanding sanctions, penalties or remedies imposed or agreed to under the Student Code of Conduct (Code) or Policy 6.4. Where a formal complaint under the Code or Policy 6.4 is pending, the University will withhold awarding a degree otherwise earned until the adjudication process set forth in those procedures is complete, including the satisfaction of any sanctions, penalties or remedies imposed.

Financial Obligations. Outstanding financial obligations will not impact the awarding of a degree otherwise earned or a student's ability to access their official transcript. However, the University may withhold issuing a diploma until any outstanding financial obligations owing to the University are satisfied.

Learning Outcomes

- Make an original and substantial contribution to the discipline
  -Think originally and independently to develop concepts and methodologies.
  -Identify new research opportunities within one's field.
- Demonstrate advanced research skills
  -Synthesize existing knowledge, identifying and accessing appropriate resources and other sources of relevant information and critically analyzing and evaluating one's own findings and those of others.
  -Master application of existing research methodologies, techniques, and technical skills.
  -Communicate in a style appropriate to the discipline.
- Demonstrate commitment to advancing the values of scholarship
  -Keep abreast of current advances within one's field and related areas.
  -Show commitment to personal professional development through engagement in professional societies, publication, and other knowledge transfer modes.
  -Show a commitment to creating an environment that supports learning—through teaching, collaborative inquiry, mentoring, or demonstration.
- Demonstrate professional skills
  -Advance ethical standards in the discipline.
  -Listen, give, and receive feedback effectively.