Graduate Studies in Civil Systems

The Department of Civil, Environmental, and Architectural Engineering (CEAE) at the University of Colorado at Boulder offers a graduate program in Civil Systems leading to the degrees of Master of Science (MS) and Doctor of Philosophy (PhD). The Civil Systems program is an interdisciplinary effort among the CEAE department graduate programs as well as individual programs from departments throughout the University of Colorado. Students apply to the Civil Systems graduate program within the CEAE department and have the opportunity to develop a customized program that fits individual academic and professional goals.

Degree Requirements

The M.S. degree may be obtained under one of three options. **Plan I** (thesis option) requires a total of 30 semester hours of which 24 must be course work. **Plan IIa** requires 27 semester hours of course work and an independent report. **Plan IIb** requires 30 semester hours of course work. The Ph.D. degree requires completion of 30 semester hours in addition to a doctoral dissertation (30 thesis hours). Students may transfer 9 units of post-graduate work to the MS degree and 15 units to a PhD degree. With prior approval, online courses through the University of Colorado or other approved universities can be applied to the degree course requirements.

Program Objectives

Graduate study in Civil Systems prepares students to plan and manage civil infrastructure systems on multiple scales from individual town or village level to mega-cities. This program allows students with interests that span traditional civil engineering disciplines as well as outside fields to focus on the global, societal, and infrastructure issues of today. Applying engineering, social science, economic, and public policy approaches, civil systems students will learn to adopt a large-scale, systems analysis approach to the development, management and monitoring of civil infrastructure systems under natural and society-induced hazards. Students will learn to integrate model-based analysis, field and laboratory experiments, and life-cycle decisions to address the built and human environment.

Areas of Emphasis

- **Interdisciplinary Topic Areas**
  - Engineering for Developing Communities
  - Engineering for Society
  - Sustainable Development
  - Disaster Planning and Recovery
  - Climate Change and Adaptation
- **Traditional CEAE Disciplines**
  - Building Systems
  - Construction Engineering and Management
  - Environmental Engineering
  - Geotechnical Engineering
  - Structural Engineering and Structural Mechanics
  - Water Resources Engineering

Course Offerings

<table>
<thead>
<tr>
<th>4 Core Requirements</th>
<th>12 hours</th>
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<tbody>
<tr>
<td>CVEN 5147 Civil Engineering Systems &amp; Planning</td>
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<tr>
<td>CVEN 5454 Statistical Methods for Civil Systems or equivalent¹</td>
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<tr>
<td>CVEN 5565 Life-Cycle Engineering Of Civil Infrastructure Systems</td>
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<td>A CU or on-line course emphasizing the techniques and/or societal applications of systems</td>
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<tr>
<th>3 Courses in Area of Emphasis</th>
<th>9 hours</th>
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<td>Area of emphasis can be from a traditional CEAE area or interdisciplinary with committee approval</td>
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<th>1 Free Elective</th>
<th>3 hours</th>
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<tbody>
<tr>
<td>Plan I</td>
<td>MSc Thesis</td>
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<tr>
<td>Plan IIa</td>
<td>1 Elective</td>
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<td>MS Report</td>
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<td>Plan IIB</td>
<td>2 Electives</td>
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Undergraduate Prerequisites

For entering graduate students who do not have a Bachelor of Science degree in engineering, a number of undergraduate engineering courses may have to be made up prior to graduation. We require proficiencies in the following undergraduate courses:

- Calculus, Linear Algebra, Differential Equations (equivalent to APPM 1350, 1360, and 2350)
- Two semesters of physics (equivalent to PHYS 1110 and 1120)
- One semester of basic sciences (Geology, Chemistry, or Biology)
- Analytical Mechanics I or Statics (equivalent to CVEN 2121)
- Fluid Mechanics (equivalent to CVEN 3313)

¹ Possible options: EMEN 5005, CVEN 5383, EDUC 8250/8260, EDUC 8230/8240
Financial Support
Support is available for qualified students in the form of teaching assistantships (TAs) or research assistantships (RAs). TAs receive a stipend of approximately $1,800 per month, a tuition waiver and 70% of their student health insurance for the academic year; fully-funded RAs receive a stipend of approximately $1,800 per month, a tuition waiver and 70% of their student health insurance. Department and University fellowships are also available.

Computer Facilities
Students interested in computer-based research will find an excellent workstation and PC-based environment in the Department. The Engineering Computer Laboratory includes eleven high performance PCs, multi-play CD ROMS, on-line data services, digital cameras, scanners and other resources for student use.

Facilities and Location
The Boulder Campus of the University of Colorado is located 26 miles northwest of Denver. The climate is dry with generally moderate temperatures. The immediate proximity to the Rocky Mountains makes the location nearly ideal for both winter and summer sports. The University has an enrollment of 25,000 undergraduate students of which 2,800 are in the College of Engineering. The Department of Civil, Environmental and Architectural Engineering has approximately 40 faculties, 450 undergraduate and 230 graduate students.

Research Activities
The faculty has wide-ranging professional and research interests that include:
- Disaster Response and Planning
- Climate Change and Impacts on Society and Infrastructure
- Seismic Vulnerability of Buildings
- Catastrophe Risk Modeling
- Performance-based Earthquake Engineering
- Policy and Research on Engineering and Management Decisions for Civil Infrastructures
- Life Cycle Cost Optimization of Civil Infrastructures
- Reliability and Resilience of Storm and Wastewater Systems
- River Basin Management; Wind-Hydropower Systems
- Drought Management
- Urban Infrastructure in Developing Countries
- Organization Performance
- Globalization and Global Knowledge Integration

Doctoral Students
Doctoral students are required to take two exams in addition to their course work and final doctoral defense. A full-day preliminary exam should be taken at the end of their first year of doctoral work and consists of five written questions in selected subject areas. A comprehensive exam consisting of a written proposal and an oral examination should be taken with at least 2-3 semesters left in the student’s doctoral work. Students cannot have more than 10 dissertation hours count towards their degree prior to the semester of the comprehensive exam.

Faculty Members
Bernard Amadei, Professor, Ph.D., N.A.E, University of California, Berkeley. Engineering for Developing Communities and International Development, Geological Engineering
(303-492-7734, amadei@colorado.edu)

Rajagopalan Balaji, Professor, Ph.D., Utah State University. Hydroclimatology, Stochastic Hydrology, Climate Extremes, Nonlinear time series analysis, probabilistic modeling.
(303-492-5968, balajir@colorado.edu)

Paul Chinowsky, Professor, Ph.D., Stanford University. Climate Choice Impacts, Strategic Planning, Engineering Organizations.
(303-735-1063, paul.chinowsky@colorado.edu)

Ross B. Corotis, Professor, P.E., N.A.E., Ph.D., Massachusetts Institute of Technology. Probabilistic modeling, risk assessment and perception, structural reliability.
(303-735-0539, corotis@colorado.edu)

Amy Javernick-Will, Assistant Professor, Ph.D., Stanford University. Global Projects, Global engineering and construction Organizations, Organizational learning, Knowledge management, disaster recovery.
(720-220-7220, amy.javernick@colorado.edu)

Abbie Liel, Assistant Professor, Ph.D., Stanford University. Seismic collapse performance prediction of structures and structural systems; life safety risks and economic losses; earthquake performance of housing and schools internationally.
(303-492-1050, abbie.liel@colorado.edu)

Keith Porter, Associate Research Professor, Ph.D., Stanford University. Seismic vulnerability of buildings, catastrophe risk modeling, performance-based earthquake engineering.
(303-952-0426, keith@cohen-porter.net)

JoAnn Silverstein, Professor, Ph.D. University of California, Davis. Conventional and advanced wastewater treatment, Utility Management, Distributed Water Systems.
(303-492-7211, joann.silverstein@colorado.edu)

Edith Zagona, Research Professor, P.E., Ph.D., University of Colorado. Water resources systems and modeling, hydropower, decision support, adaptation for climate change.
(303-492-2189, zagona@colorado.edu)

Applications
Students should apply to the Civil Systems graduate program within CEAE. For additional information and application forms, please contact:

Pamela Williamson, Graduate Coordinator
Department of Civil, Environmental and Arch. Engineering
University of Colorado, Boulder, CO 80309-0428
Tel: 303-492-7316; Fax: 303-492-7317
E-mail: Pamela.Williamson@colorado.edu