ARCHITECTURAL ENGINEERING - DOCTOR OF PHILOSOPHY (PHD)

Graduate studies in architectural engineering are offered through the Department of Civil, Environmental and Architectural Engineering. The department offers a PhD degree with study emphases in several major areas:

- Building Energy Engineering
- Illumination Engineering
- Materials and Carbon
- Construction Engineering and Management

For more information, visit the department's Graduate Studies (http://www.colorado.edu/ceae/prospective-students/graduate-studies/) webpage.

Requirements

Course Requirements

A total of 30 credit hours of graduate-level coursework plus 30 dissertation credit hours are required for the program.

Focus areas include:

- Building Energy Engineering
- Illumination Engineering
- Materials & Carbon
- Construction Engineering & Management

There is no requirement for picking a specific focus area and students can select from courses under any of the four focus areas. Students must complete a minimum of 9 credit hours from the list of courses.

Code	Title	Credit Hours
Core Courses		
Required for all students with no AREN undergraduate degrees		
AREN 5001	Building Science and Engineering I	3
AREN 5002	Building Science and Engineering II	3
General Courses		**9**
Suitable for any focus area		
AREN 5890	Sustainable Building Design	
AREN 5990	Compu Fluid Dynamics (CFD) Analysis for Built/Natural Envmnts	
AREN 5830	Architectural Engineering Special Topic (Building Systems Modeling and Simulation)	
AREN 5030	Data Science for Energy and Buildings	
CVEN 5006	Construction Engineering and Management Fundamentals	
Focus Area: Building Energy Engineering		
AREN 5010	Energy System Modeling and Control	
AREN 5020	Building Energy Audits	
AREN 5061	Distributed Electricity Generation	
AREN 5080	Computer Simulation of Building Energy Systems	
AREN 5090	Optimizing Grid Connected Systems	
AREN 5110	Building Energy Systems Engineering	
AREN 5570	Building Electrical Systems Design 1	
ECEN 5007	Special Topics (Data Analytics and Decision-making for Power Systems)	
ECEN 5007	Special Topics (Renewable Energy Future of Power Grid)	
ECEN 5007	Special Topics (Power Systems Planning and Optimizations)	
Focus Area: Illumination Engineering		
AREN 5130	Optical Design for Illumination and Solid State Lighting	
AREN 5550	Illumination 2	
AREN 5540	Architectural Exterior and Landscape Lighting Design	
AREN 5560	Luminous Radiative Transfer	
AREN 5580	Daylighting	
AREN 5620	Adaptive Lighting Systems	
AREN 5630	Advanced Lighting Design	
Focus Area: Materials and Carbon		
AREN 5650	Forensic Engineering	
CVEN 5835	Special Topics for Seniors/Grads (Design of Wood Structures)	
AREN 5660	Embodied Carbon in Buildings	
CVEN 5835	Special Topics for Seniors/Grads (Design of Masonry Structures)	
CVEN 5831	Special Topics (Construction Materials)	
Focus Area: Construction Engineering & Management		
CVEN 5246	Legal Aspects of Construction	
CVEN 5276	Engineering Risk and Decision Analysis	
CVEN 5226	Construction Safety	
CVEN 5346	Managing Construction and Engineering Projects and Organizations	
CVEN 5446	Infrastructure Asset Management	

Residency Requirements

For an entrant from another university, up to 21 hours of acceptable graduate courses may be transferred, leaving at least 9 hours of coursework to be completed at the University of Colorado upon the approval of their advisors. The transfer credits are transferable at the discretion of the research advisor, and students may be asked to take additional courses toward the completion of their degree. Work already applied toward a graduate degree received from the University of Colorado or another institution cannot be accepted for transfer toward another graduate degree of the same level at the University of Colorado. All courses accepted for transfer must be graduate-level courses. A course in which a grade of B- or lower was received will not be accepted for transfer.

For students already in the MS program in the CEAE department, 30 hours of graduate coursework performed at CU is applicable towards the PhD degree upon the approval of their advisors. The PhD also requires that 30 hours of dissertation credit be taken, with a minimum residency of two years. After passing the comprehensive exam, PhD candidates are

required to maintain continuous registration. Candidates must register for at least 5 hours of dissertation credits each semester.

Preliminary Examination

Each doctoral student shall take a preliminary examination as determined by the faculty of the specialty area in which the student is enrolled, normally not later than 24 months from the time the student is first enrolled in the doctoral program. Each CEAE group has a designated time for PhD students to take the exam. Students should discuss the schedule, date and format of the exam with their academic adviser.

Comprehensive Examination

Before admission to candidacy for the doctoral degree, students must pass a comprehensive examination, which shall consist of an oral examination in the field of concentration and related fields. At the comprehensive examination, the student shall present a plan for the dissertation research to the Advisory Committee for approval.

PhD Dissertation

Students must write a dissertation based on original research conducted under the supervision of a graduate faculty member. The dissertation must fulfill all Graduate School requirements. After the dissertation is completed, an oral final examination on the dissertation and related topics is conducted by the student's doctoral committee.

Time Limit

All degree requirements must be completed within six years of the date of commencing coursework.

Graduate Certificate in Global Engineering

Students admitted to the Graduate Certificate in Global Engineering (https://catalog.colorado.edu/graduate/colleges-schools/engineering-applied-science/programs-study/civil-engineering/engineering-developing-communities-graduate-certificate/) program must fulfill the coursework and practicum requirements of that program. For AREN students, up to 6 credits of the required certificate coursework can count as coursework needed for the PhD degree.

Learning Outcomes

By the completion of the program, students will be able to:

- Demonstrate a mastery of fundamentals of architectural engineering.
- Analyze and develop advanced solutions to improve the performance and/or construction of buildings.
- Communicate knowledge through effective oral presentations and technical writing.
- Design and conduct high-quality, original research in architectural engineering.