CIVIL ENGINEERING - PROFESSIONAL MASTER OF SCIENCE (MSCVE)

The Department of Civil, Environmental and Architectural Engineering offers a professional master's degree tailored toward working engineers who desire to develop a new skill set. The programs are coursework based and result in a Master of Science degree.

Areas of Emphasis

Water Engineering and Management Emphasis

CU Boulder's professional Master of Science degree in civil engineering, with an emphasis in water engineering and management (WE&M), combines technical courses in environmental and civil engineering with highly-valued professional, non-technical skills in communication, leadership, management, utility finance and governance. The water engineering and management program provides students with leadership skills so they can effectively manage teams and initiatives typically faced in the water profession.

The water engineering and management professional master's program (PMP), designed for working professionals, provides the tools you need to produce results and solve increasingly complex problems in the water profession. Courses are delivered on campus and live streamed/recorded options over the internet, allowing working professionals from around the world to earn a graduate MS degree while continuing to put the learning into practice in their work.

Students are young and mid-career professionals working for utilities, consulting firms, government and regulatory agencies, looking to advance their careers in the water industry. With faculty of senior water professionals from across the country, including those from utilities, consulting firms, and global professional organizations, students gain an opportunity to network and learn through real work case studies.

All of the graduate courses are available to distance and on campus students. All the students can come to class, watch the live classes over Zoom and/or the recorded Zoom classes. The PMP program is a coursework-only degree and requires 30 credits. These credits can be obtained with ten, 3-credit hour courses.

The WE&M courses are available for a WE&M graduate certificate (https://www.colorado.edu/ceae/water-engineering-management-certificate/) or as an Professional MS degree (https://www.colorado.edu/ceae/water-engineering-management-professional-masters-program/).

Global Engineering Emphasis

The master of science degree in civil engineering with an emphasis in global engineering is a unique program offered by the Mortenson Center at CU Boulder. This degree is a professional track of the MS program in civil engineering. It is designed to offer students exposure to a breadth of knowledge in relevant areas such as global health, development economics and impact evaluation, while also building technical skills and providing the opportunity for further study in a specific area of interest within global engineering. In addition to classroom-based learning, students are required to complete a field practicum, embedded for six weeks to six months with a global development organization. These practicum placements have taken place in over 50 countries, partnering with over 80 organizations. Learn more about our practicum partnerships on the Mortenson Center (https://www.colorado.edu/center/mortenson/education/practicum-placements/) website.

Our graduates are able to provide technical expertise to development agencies or other firms by recognizing the many facets of community development that are critical to sustainable solutions. Students gain skills in data analysis, project management and systems thinking so they can help create and implement solutions to address worldwide needs.

For more information, visit the Mortenson Center in Global Engineering (https://www.colorado.edu/center/mortenson/) webpage.

Dual-Track Civil Engineering Emphasis

The dual-track professional master of science degree in civil engineering provides students and practicing professionals graduate-level engineering specialization and technical competence in more than a single area. The intended cross-disciplinary training and perspective is often needed to serve or lead in the diverse field of civil engineering where engineers typically have to work in and interact with others from more than one discipline in large and small projects, private and government sectors, in design and development as well as consulting services. The broader technical preparation expands their career opportunities, professional outlook and provides multiple pathways to leadership and management positions. The high demand nationally for more broadly trained graduates in civil engineering to satisfy our sustainable and resilient infrastructure needs and in turn the national's overall economical development points to the benefit of a cross-disciplinary general civil engineering coursework-only professional master's degree.

For more information, visit the department (https://www.colorado.edu/ceae/civil-engineering-professional-master-science-mscve-dual-track-option/) website.

Requirements

Course Requirements

The following course requirements are subject to change; for the most current information, visit the department's Water Engineering & Management webpage or the Mortenson Center in Global Engineering (https://www.colorado.edu/center/mortenson/) webpage.

The professional master's degree requires a total of 30 credit hours, at least 24 of which must be completed at the 5000 level or above. At least 18 credit hours must be from coursework in CVEN.

Time Limit

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

Areas of Emphasis

Water Engineering & Management Emphasis

This emphasis requires at least 30 credit hours from the following categories.

Code	Title	Credit Hours
Environmental Engineering Core Courses		
CVEN 5464	Environmental Engineering Processes	3
CVEN 5404	Water Chemistry	3

CVEN 5484	Integrative Environmental and Molecular Microbiology	3
Choose one:		3
CVEN 5524	Drinking Water Treatment	
CVEN 5534	Wastewater Treatment	
CVEN 5474	Hazardous and Industrial Waste Management	
Water Engineering & Management Core Courses		
CVEN 5564	Water Profession: Communication and Utility Finance	3
CVEN 5574	Water Utility Management: Current Issues and Future Challenges	3
CVEN 5584	Water Profession: Leadership and Management	3
Electives & Master's Report and Seminar Courses		
Choose from the the following for a total of 9 credits:		9
Civil engineering electives (3-9 credits)		
Public affairs electives at CU Denver (0-3 credits)		
Master's Report and Seminar (2 credits)		
Additional courses to fulfill 30-credit minimum, if necessary.		
Total Credit Hours		**30**

Global Engineering Emphasis

This emphasis requires at least 30 credit hours distributed as follows.

- **Required core courses**: All global engineering emphasis students start their program with Hazard, Resilience and Sustainability for the Natural and Built Environments or Global Development for Engineers, each of which introduces students to the complexities of global climate change and its hazards, inequalities and opportunities, providing a survey approach to understanding major historical causes, theories, institutions, policies and emerging solutions. The Global Engineering and Hazard Resilience Practicum provides students with a field-based and/or team project-based opportunity to synthesize and integrate knowledge acquired in Mortenson Center courses and other learning experiences and to apply theory and principles in a situation that approximates professional practice in global engineering and hazard resilience. Students typically fulfill the practicum requirement the summer after the first academic year in the program. These two core courses fulfill six of the required 30 credits for the PMP.
- **Global sustainability recommended courses**: The courses are recommended for students to provide breadth in skills and subject matter exposure in the areas of geospatial data analytics, environmental change and socially responsible enterprise. The courses may be adjusted or substituted based on agreement with a student's advisor.
- **Global engineering and resilience series**: The Mortenson Center offers courses as a series of five-week modules, with each module worth one credit-hour. For the Professional Master in Global Engineering, students are required to complete 9-12 credit-hours from the series.

Code	Title	Credit Hours
Required Core Courses		
CVEN 5919	Global Development for Engineers	3
or CVEN 5909	Hazards, Resilience, and Sustainability for the Natural and Built Environments	
CVEN 5939	Global Engineering and Hazard Resilience Practicum	3
Global Sustainability Recommended Courses		**12-15**
ENVS 5100	Special Topics in Environmental Studies (Geospatial Data Analytics)	
ENVM 5018	The Scientific Basis of Environmental Change	
MBAX 6000	Socially Responsible Enterprise	
Electives		
Global Engineering and Resilience Series		**9-12**
Principles		
CVEN 5109	Introduction to Environmental and Development Economics for Engineers	
CVEN 5119	Introduction to Global Health for Engineers	
Project Management		
CVEN 5129	Program and Project Management	
CVEN 5139	Solution Identification and Proposal Development	
Field Methods		
CVEN 5979	Community Appraisal	
CVEN 5989	Study Design and Impact Evaluation	
CVEN 5999	Data Analytics for Development	
Water, Sanitation and Hygiene (WASH)		
CVEN 5969	Water, Sanitation, and Hygiene	
Disaster Risk Reduction and Recovery		
EVEN 5979	Introduction to Humanitarian Aid	
EVEN 5989	Disaster Risk Reduction	
EVEN 5999	Refugees and Displacement	
Household Energy		
MCEN 5299	Household Energy Systems	
Total Credit Hours		**30**

[1] Global Engineering Series course options can be found on the Mortenson Center (https://www.colorado.edu/center/mortenson/graduate-education/professional-masters-degrees/) website.

Dual-Track Emphasis

For this emphasis, students are required to:

1. Select 9 credit hours from the courses listed in **Group A** and 15 credit hours from **Group B** of more than one **sub-areas listed below**.
2. Select 6 credits of 5000-level free electives from the extensive course offerings from civil or other engineering disciplines in the College or professional management classes, collectively referred to as **Group C**.

Code	Title	Credit Hours
Sub-area 1: Structural Engineering		
Group A		
CVEN 5161	Advanced Mechanics of Materials I	
CVEN 5525	Computational Structural Analysis 1	
CVEN 5511	Introduction to Finite Element Analysis	
CVEN 5111	Structural Dynamics	
Group B		
CVEN 5575	Advanced Topics in Steel Design	

CVEN 5585	Advanced Topics in Reinforced Concrete Design
CVEN 6595	Earthquake Engineering
Sub-area 2: Construction Engineering	
Group A	
CVEN 5006	Construction Engineering and Management Fundamentals
CVEN 5226	Construction Safety
CVEN 5346	Managing Construction and Engineering Projects and Organizations
CVEN 5446	Infrastructure Asset Management
Group B	
CVEN 5246	Legal Aspects of Construction
CVEN 5276	Engineering Risk and Decision Analysis
CVEN 5836	Special Topics for Seniors/Grads (BIM for Capital Projects)
CVEN 5836	Special Topics for Seniors/Grads (AI/ML in the Built Environment)
Sub-area 3: Geotechnical Engineering	
Group A	
CVEN 5708	Soil Mechanics
CVEN 5798	Dynamics of Soils and Structures
CVEN 5788	Computational Modeling in Geotechnical Engineering
CVEN 5768	Introduction to Rock Mechanics
Group B	
CVEN 5628	Seepage and Slopes
CVEN 5728	Foundation Engineering
CVEN 5818	Geotechnical Earthquake Engineering
Sub-area 4: Water Resources Engineering	
Group A	
CVEN 5333	Physical Hydrology
CVEN 5353	Groundwater Hydrology
CVEN 5313	Environmental Fluid Mechanics
CVEN 5454	Statistical Methods for Natural and Engineered Systems
CVEN 5537	Numerical Methods in Civil Engineering
Group B	
CVEN 5363	Modeling of Hydrologic Systems
CVEN 5393	Water Resources System and Management
CVEN 5383	Applied Groundwater Modeling
CVEN 5343	Transport and Dispersion in Surface Water
CVEN 5423	Water Resources Engineering Design

Learning Outcomes

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

- Demonstrate a mastery of the fundamentals of their chosen civil engineering discipline.
- Communicate knowledge through effective oral presentations and technical writing.
- Successfully gain hands-on experience with civil engineering methods through hands-on projects or research.