

CIVIL ENGINEERING, MS

Introduction

Graduate Education Policies and Procedures apply to these programs.

There are many reasons to consider a master's degree in Civil Engineering:

- Gain advanced training in your chosen civil engineering specialty.
- Become an expert in your chosen thesis (or report) research.
- Position yourself in a competitive employment market.
- Earn more than those with only a bachelor's degree.

The Master of Science (MS) in Civil Engineering at CU Denver is intended for students who have previously earned an undergraduate degree in engineering or a similar field. Students of other backgrounds are welcome but usually have more prerequisites to complete before they can be admitted to the MS program.

The Civil Engineering graduate program is designed for both full-time and part-time students who want to advance their academic and professional skills in civil engineering and related areas. Our graduate programs are designed for working professionals and offer ample opportunities for hands-on research.

Many students are full-time, while many also work full-time jobs and complete evening classes. Depending on a student's pace, the master's program typically takes 2-4 years to complete. Most graduate courses are offered in the afternoons or evenings.

Specialty Areas

- Construction Engineering and Management
- Geomatics and Geographic Information Systems (GIS)
- Geotechnical Engineering
- Hydrologic, Environmental, and Sustainability Engineering
- Structural Engineering
- Transportation Engineering

Program Prerequisites

Prerequisite classes are in addition to the 30 semester hours needed to complete a master's degree, as they are necessary background information that is usually included in an engineering bachelor's program. Students must receive a grade of C minus (C-) or better for the prerequisite class to apply to the program.

Students may complete prerequisite classes either before or after being admitted to a degree program. However, applicants with 5 or more incomplete prerequisites will not be admitted. You may complete no more than nine credit hours of graduate work before completing these prerequisites. Note, all courses taken at CU Denver while enrolled graduate studies count toward your grade point average (GPA).

If prerequisites are taken after admission to the master's program, students must maintain a 3.0 overall GPA, per Graduate Education policies and procedures. The student's faculty advisor may also specify undergraduate courses that must be completed before starting graduate course work, but these will not count toward the semester hour requirements for the degree.

Transfer Credits

Master's students may transfer up to 9 semester hours from another institution toward their master's degree, if approved by their advisor. Students who completed their undergraduate degree at CU Denver may have additional options available.

Program Requirements

1. Students must complete a minimum of 30 credit hours at the graduate level, including a master's report or thesis.
2. Students must complete 6 credit hours of master's thesis or 3 credits of master's report. Both require a written comprehensive exam and an oral defense to a committee of at least two graduate faculty for a report and three graduate faculty for a thesis. The student's topic must be approved by the faculty advisor.
3. Students must complete a minimum of 15 credit hours in your chosen host department or within Civil Engineering, not including master's report or thesis. Any courses taken outside your host department must be approved by advisor.
4. Students must earn a minimum grade of B- (2.7) in all major courses taken at CU Denver and must achieve a minimum cumulative major GPA of 3.0. All graded attempts in required and elective courses are calculated in the major GPA. Students cannot complete any course requirements as pass/fail, or satisfactory/unsatisfactory.
5. The MS must be completed within seven years of the date the student begins the degree program.

Construction Engineering and Management

The Master's program in construction engineering and management provides the necessary decision-making skills to support complex construction projects and subsequent management throughout their useful life. Construction engineering and management concerns the design, planning and management of the construction, maintenance and disposal of structures, infrastructure, transportation systems, site work, and commercial, industrial, residential and environmental projects (for example: highways, bridges, airports, buildings, dams, reservoirs, light and high-speed rail systems, hospitals, laboratories, residential communities, utilities and environmental restoration projects).

Code	Title	Hours
<i>Research Credits (requires advisor approval). Choose 1 of the following</i>		
CVEN 5950	Master's Thesis	6
CVEN 5960	Master's Report	3
<i>Required core courses</i>		9
CEMT 5231	Construction Materials and Methods	
CEMT 5232	Construction Planning and Control	
CEMT 5233	Construction Cost Estimating	
<i>Construction Electives</i>		9
CEMT 5234	Sustainable Construction	
CEMT 5235	Advanced Construction Engineering	
CEMT 5236	Project Management Systems	
CEMT 5237	Advanced Project Management	
CEMT 5238	Integrated Construction Leadership	
CEMT 5239	Introduction to Temporary Structures and Construction Engineering	
CEMT 5240	Building Information Modeling (BIM)	

CEMT 5242	Construction Safety	
CEMT 5246	Construction, Business and Innovation	
<i>General Electives</i>		6-9

Course selection should be based on planned career path, masters report focus, eligibility and availability of the courses. The following courses are some of the possibilities, but you should discuss course choices with your advisor.

Any 5000+ CVEN or CEMT course		
ARCH 5450	Sustainable Design Practices	
ARCH 6313	LEED Certification, Greenbuilding Seminar	
BANA 6720	Simulation Modeling	
BIOL 5460	Environmental Toxicology	
BUSN 6520	Leading Individuals and Teams	
ENGR 5301	Systems Engineering: Principles and Practice	
ENTP 6020	Business Model Development & Planning	
ENVS 5010	Landscape Biogeochemistry	
GEOG 5220	Environmental Impact Assessment	
INTB 6020	Cross-Cultural Management	
LDAR 5532	Landform Manipulation	
MGMT 6808	Leadership Development	
PUAD 5644	Environmental and Hazards Law	
URPL 5050	Urban Development	
URPL 6500	Environmental Planning/Management	
Other topics as approved by faculty advisor		

Geomatics and Geographic Information Systems (GIS)

The Geomatics Engineering and Geographic Information Systems (GIS) graduate program at the University of Colorado Denver provides broad-based expertise and cutting-edge skills that span the growing geospatial field and helps alleviate the shortage of well-educated geospatial professionals. The program is intended for engineers and other geospatial, environmental and urban infrastructure professionals seeking skills in using and managing rapidly developing geospatial data technologies.

All GIS graduate courses are entirely online, as they have been for more than 20 years. However, master's degree students have the option of taking some courses on the CU Denver campus from other programs such as geography or computer science.

Our Geomatics and GIS curriculum covers a wide range of geospatial principles. Students learn from industry professionals in areas of surveying, geodesy, mapping science and cartography, photogrammetry, remote sensing, high-definition surveying, and relational GIS databases.

Our program prepares graduates for careers in industry and/or science. Students who complete the program have a comprehensive understanding in these disciplines, empowering them to advance their careers in geospatial engineering and analysis or to continue their research.

Code	Title	Hours
<i>Research credits (requires advisor approval) Choose 1 of the following</i>		
CVEN 5950	Master's Thesis	6
CVEN 5960	Master's Report	3
<i>Required course</i>		

CVEN 5381	Introduction to Geographic Information Systems	3
<i>Civil Engineering GIS electives</i>		21-24
CVEN 5382	Geospatial Data Development	
CVEN 5384	GIS Project Management	
CVEN 5385	GIS Relational Database Systems	
CVEN 5387	Advanced Remote Sensing	
CVEN 5390	Interactive Web Mapping GIS	
CVEN 5391	Introduction to Geomatics	
CVEN 5392	Unmanned Aerial Systems	
CVEN 5395	GPS/GNSS	
CVEN 5396	HDS/LiDAR Tools & Data Analyses	
Other topics as approved by faculty advisor		

Geotechnical Engineering

The Master of Science program in geotechnical engineering offers opportunities for study and research in design and construction of structures built on, in or of natural/improved soils or rocks. As desirable construction sites in urban settings are fast becoming fewer, innovations in geotechnical engineering are arguably some of the most intriguing and interesting. Geotechnical engineering covers diverse areas such as earth retaining structures, reinforced soil structures, dams, tunneling, bridge abutments, landslide stabilization, environmental geotechnics, in-situ testing, new soil composites, soil-structure interaction, earthquake engineering, subsurface characterization, ground improvement, computational geomechanics, and geosynthetics.

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<i>Research credits (requires advisor approval). Choose 1 of the following</i>		
CVEN 5950	Master's Thesis	6
CVEN 5960	Master's Report	3
<i>Civil Engineering Geotechnical electives</i>		24-27
CVEN 5708	Advanced Soils Engineering	
CVEN 5718	Engineering Properties of Soils	
CVEN 5738	Foundation Engineering	
CVEN 5758	Foundations on Expansive Soils	
CVEN 5798	Dynamics of Soils and Foundations	
Additional courses are selected by mutual agreement of the student and faculty advisor after admission to the degree program.		

Hydrologic, Environmental, and Sustainability Engineering

The graduate track in hydrologic, environmental, and sustainability engineering (HESE) in the Department of Civil Engineering at the University of Colorado Denver brings together the hydrologic cycle, environmental processes, and sustainability—the powerful notion that everything we engineer should support economic prosperity, environmental health, and social justice.

Graduate coursework in the HESE track requires breadth and depth. Students are required to take at least one graduate course in each of the three areas plus at least two additional courses in one of those three areas. The program also includes graduate-level electives, allowing students to customize their program to match their professional needs and intellectual curiosity.

Code	Title	Hours
<i>Research credits (requires advisor approval). Choose 1 of the following</i>		
CVEN 5950	Master's Thesis	6
CVEN 5960	Master's Report	3
Breadth courses		9
Depth courses		9
Elective courses		6-9
<i>Hydrology and Hydraulics</i>		
CVEN 5333	Surface Water Hydrology	
CVEN 5334	Groundwater Hydrology	
CVEN 5335	Vadose Zone Hydrology	
CVEN 5426	Pipe Network and Sewer Design	
CVEN 5427	Storm Water System Design	
<i>Environmental Engineering</i>		
CVEN 5401	Introduction to Environmental Engineering	
CVEN 5402	Contaminant Fate and Transport	
CVEN 5404	Water and Wastewater Treatment	
<i>Sustainability Science</i>		
CVEN 5405	Environmental Life Cycle Assessment	
CVEN 5407	Complex Systems Methods	
CVEN 5460	Introduction to Sustainable Urban Infrastructure	
CVEN 5464	Sustainability and Climate Change	
<i>Other topics as approved by faculty advisor</i>		

Structural Engineering

Structural engineering is the analysis and design of structures that support or resist loads. At CU Denver the area of structural engineering includes structural and bridge engineering; repair, evaluation, maintenance and rehabilitation of civil infrastructure, maintenance and experimental analysis of concrete; and more.

Code	Title	Hours
<i>Research credits (requires advisor approval). Choose 1 of the following</i>		
CVEN 5950	Master's Thesis	6
CVEN 5960	Master's Report	3
<i>Structural Engineering Electives</i>		24-27
CVEN 5110	Advanced Structural Classical Analysis	
CVEN 5111	Structural Dynamics	
CVEN 5112	Structural Design Loads	
CVEN 5540	Masonry Design	
CVEN 5550	Highway Bridge Design	
CVEN 5565	Advanced Timber Structure Design	
CVEN 5575	Advanced Topics in Structural Steel Design	
CVEN 5585	Advanced Topics in Reinforced Concrete	
CVEN 5590	Design of Prestressed Concrete	
CVEN 5591	Design of Composite Structures	
CVEN 5592	Computer-Aided Structural Analysis and Design	
CVEN 5682	Pavement Design	
CVEN 6111	Structural Dynamics II	
<i>Other topics as approved by faculty advisor</i>		

Transportation Engineering

Code	Title	Hours
The Master of Science program in transportation places an emphasis for courses and research on transportation engineering, planning, operations and management. Our studies address local, state, national and international issues with funding from federal, state, local and private sources. We develop and investigate new methods and technologies to analyze the performance and safety of alternative transportation operations and designs.		
<i>Research credits (requires advisor approval). Choose 1 of the following</i>		
CVEN 5950	Master's Thesis	6
CVEN 5960	Master's Report	3
<i>Transportation Engineering Electives</i>		24-27
CVEN 5602	Advanced Highway Design	
CVEN 5611	Transportation Engineering Statistics	
CVEN 5612	Traffic Impact Assessment	
CVEN 5621	Highway Capacity Analysis	
CVEN 5622	Traffic Operations and Control	
CVEN 5631	Transport Modeling and Big Data	
CVEN 5633	Sustainable Transportation Systems	
CVEN 5650	Urban Street Design	
CVEN 5662	Transportation System Safety	
<i>Other topics as approved by faculty advisor</i>		