CIVIL ENGINEERING, MS

Introduction

Graduate School Policies and Procedures (http://catalog.ucdenver.edu/cu-denver/graduate/graduate-school-policies-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 School rules. 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 many 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 (3.0) 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.
5. Every graduate student must also satisfy the degree requirements of the Graduate School on the Denver campus, specified in the Information for Graduate Students section of this catalog.
6. 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).

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CVEN 5950</td>
<td>Master’s Thesis</td>
<td>6</td>
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<td>CVEN 5960</td>
<td>Master’s Report</td>
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<td>Required core courses</td>
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<tr>
<td>CEMT 5231</td>
<td>Construction Materials and Methods</td>
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<td>CEMT 5232</td>
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<td>CEMT 5233</td>
<td>Construction Cost Estimating</td>
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<td>Construction Electives</td>
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<tr>
<td>CEMT 5234</td>
<td>Sustainable Construction</td>
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<td>CEMT 5235</td>
<td>Advanced Construction Engineering</td>
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<td>CEMT 5236</td>
<td>Project Management Systems</td>
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<tr>
<td>CEMT 5237</td>
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<tr>
<td>CEMT 5238</td>
<td>Integrated Construction Leadership</td>
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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.

Geomatics and Geographic Information Systems (GIS)

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Geomechanics

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.

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
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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

| Research credits (requires advisor approval). Choose 1 of the following |
|-------------------|-------------------|
| CVEN 5950         | Master's Thesis   | 6    |
| CVEN 5960         | Master's Report   | 3    |
| Breadth courses   |                   | 9    |
| Depth courses     |                   | 9    |
| Elective courses  |                   | 6-9  |

### Hydrology and Hydraulics
- 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

### Environmental Engineering
- CVEN 5401 Introduction to Environmental Engineering
- CVEN 5402 Contaminant Fate and Transport
- CVEN 5404 Water and Wastewater Treatment

### Sustainability Science
- CVEN 5405 Environmental Life Cycle Assessment
- CVEN 5407 Complex Systems Methods
- CVEN 5460 Introduction to Sustainable Urban Infrastructure
- CVEN 5464 Sustainability and Climate Change

Other topics as approved by faculty advisor

## 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.

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| Research credits (requires advisor approval). Choose 1 of the following |
|-------------------|-------------------|
| CVEN 5950         | Master's Thesis   | 6    |
| CVEN 5960         | Master's Report   | 3    |
| Structural Engineering Electives |                   | 24-27 |
- CVEN 5110 Advanced Structural Classical Analysis
- CVEN 5111 Structural Dynamics
- CVEN 5112 Structural Design Loads
- CVEN 5514 Matrix Analysis of Structures
- 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 5682 Pavement Design

### Transportation Engineering

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.

### Code  Title                  Hours

| Research credits (requires advisor approval). Choose 1 of the following |
|-------------------|-------------------|
| CVEN 5950         | Master's Thesis   | 6    |
| CVEN 5960         | Master's Report   | 3    |
| Transportation Engineering Electives |                   | 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 & Big Data
- CVEN 5633 Sustainable Transportation Systems
- CVEN 5650 Urban Street Design
- CVEN 5662 Transportation System Safety

Other topics as approved by faculty advisor