# Civil Engineering with Concentration in Data and Systems, MSCivE

This program is designed for students with career goals that require application of data and systems analysis to challenges across any discipline of civil and environmental engineering. The degree requirements include core courses (total of 20 semester hours) in data analysis and computing, systems and sensors, and data and systems topics in civil and environmental engineering, complemented by electives across multiple departments including mathematics, computer science, engineering, economics, and policy.

| Degree Requirements | With Project | With Thesis | Coursework Only |
|---|---|---|---|
| Required core courses | 20 SH | 20 SH | 20 SH |
| Electives | 8 SH | 4 SH | 12 SH |
| Master of Science report/thesis | 4 SH | 8 SH | |
| **Minimum semester hours required** | **32 SH** | **32 SH** | **32 SH** |

## Graduate Certificate Options

Students enrolled in a master's degree have the opportunity to also pursue one of the many engineering graduate certificate options in addition to or in combination with the MS degree. Students should consult their faculty advisor regarding these options (https://catalog.northeastern.edu/graduate/engineering/graduate-certificate-programs/).

### GORDON INSTITUTE OF ENGINEERING LEADERSHIP

**Master's Degree in Civil Engineering with Concentration in Data and Systems with Graduate Certificate in Engineering Leadership**

Students may complete a Master of Science in Civil Engineering with Concentration in Data and Systems in addition to earning a Graduate Certificate in Engineering Leadership (https://catalog.northeastern.edu/graduate/engineering/multidisciplinary/engineering-leadership-graduate-certificate/). Students must apply and be admitted to the Gordon Engineering Leadership Program in order to pursue this option. The program requires fulfillment of the 20-semester-hour curriculum required to earn the Graduate Certificate in Engineering Leadership, which includes an industry-based challenge project with multiple mentors. The integrated 36-semester-hour degree and certificate will require 20 hours of advisor-approved data and systems engineering technical courses.

The Department of Civil and Environmental Engineering encourages students pursuing a GIEL certificate to complete their MS coursework requirements in their first year and their GIEL certificate requirements in their second year. Students who prefer to complete their GIEL certificate requirements in their first year are asked to speak with their MS degree advisor beforehand.

## Program Requirements

- Concentrations and course offerings may vary by campus and/or by program modality. Please consult with your advisor or admissions coach for the course availability each term at your campus or within your program modality.
- Certain options within the program may be *required* at certain campuses or for certain program modalities. Please consult with your advisor or admissions coach for requirements at your campus or for your program modality.

Complete all courses and requirements listed below unless otherwise indicated. At least 20 semester hours (of the 32 semester hours) must be listed as CIVE or SBSY and must form a cohesive advisor-approved program.

## Core Requirements

| Code | Title | Hours |
|---|---|---|
| Complete 20 semester hours from the following course lists: | | 20 |
| **Data and Computing** | | |
| Complete at least 4 semester hours from the following: | | 4 |
| CIVE 5280 | Remote Sensing of the Environment | |
| CIVE 7100 | Time Series and Geospatial Data Sciences | |
| or ENVR 6500 | Biostatistics | |
| or IE 6200 | Engineering Probability and Statistics | |
| or IE 7280 | Statistical Methods in Engineering | |
| or INSH 5301 | Introduction to Computational Statistics | |
| or MATH 7343 | Applied Statistics | |
| CIVE 7150 | Data-Driven Decision Support for Civil and Environmental Engineering | |
| CIVE 7151 | Urban Informatics and Processing | |

| | | |
|---|---|---|
| or PPUA 5262 | Big Data for Cities | |
| CIVE 7155 | Dynamics and Control of Infrastructure Systems | |
| DAMG 6105 | Data Science Engineering with Python | |
| DAMG 6210 | Data Management and Database Design | |
| ENVR 5260 | Geographical Information Systems | |
| IE 5640 | Data Mining for Engineering Applications | |
| or IE 7275 | Data Mining in Engineering | |
| **Systems and Sensors** | | |
| Complete at least 4 semester hours from the following: | | 4 |
| CIVE 5261 | Dynamic Modeling for Environmental Investment and Policymaking | |
| CIVE 5275 | Life Cycle Assessment of Materials, Products, and Infrastructure | |
| CIVE 5524 | Vibration-Based Structural Health Monitoring | |
| CIVE 7388 | Special Topics in Civil Engineering (Dynamics and Control of Infrastructure) | |
| EECE 5155 | Wireless Sensor Networks and the Internet of Things | |
| IE 5500 | Systems Engineering in Public Programs | |
| OR 6205 | Deterministic Operations Research | |
| OR 7230 | Probabilistic Operation Research | |
| OR 7245 | Network Analysis and Advanced Optimization | |
| PHYS 5116 | Network Science 1 | |
| PPUA 6502 | Economic Analysis for Policy and Planning | |
| PPUA 7237 | Advanced Spatial Analysis of Urban Systems | |
| **Civil and Environmental Systems** | | |
| Complete at least 8 semester hours from the following: | | 8 |
| CIVE 5281 | Coastal Dynamics and Design | |
| CIVE 5363 | Climate Science, Engineering Adaptation, and Policy | |
| CIVE 5373 | Transportation Systems: Analysis and Planning | |
| CIVE 5522 | Structural Systems Modeling | |
| or CIVE 7330 | Advanced Structural Analysis | |
| CIVE 5536 | Hydrologic and Hydraulic Design | |
| CIVE 7110 | Critical Infrastructure Resilience | |
| CIVE 7341 | Structural Reliability | |
| CIVE 7380 | Performance Models and Simulation of Transportation Networks | |
| CIVE 7381 | Transportation Demand Forecasting and Model Estimation | |
| CIVE 7385 | Public Transportation | |
| IE 7200 | Supply Chain Engineering | |
| OR 7310 | Logistics, Warehousing, and Scheduling | |
| SBSY 5100 | Sustainable Design and Technologies in Construction | |
| SBSY 5200 | Sustainable Engineering Systems for Buildings | |
| SBSY 5250 | Building Performance Simulation | |

## Options

Complete one of the following options:

### COURSEWORK OPTION

| Code | Title | Hours |
|---|---|---|
| Complete the remaining semester hours from the electives list below. | | 12 |

### REPORT OPTION

| Code | Title | Hours |
|---|---|---|
| CIVE 7945 | Master's Project | 4 |
| Complete the remaining semester hours from the electives list below. | | 8 |

### THESIS OPTION

| Code | Title | Hours |
|---|---|---|
| CIVE 7945 | Master's Project | 4 |
| CIVE 7990 | Thesis | 4 |

| | |
|---|---|
| Complete the remaining semester hours from the electives list below. | 4 |
| In addition to completing the thesis course, students must successfully complete the thesis submission process, including securing Committee and Graduate School of Engineering signatures and submission of an electronic copy of their MS Thesis to ProQuest. | |

## Course Lists

Any core course not used to meet the core course requirements can be used as an elective, as can the following electives:

**ELECTIVES LIST**

| Code | Title | Hours |
|---|---|---|
| CIVE 6566 | Sustainable Urban Transportation: Netherlands | |
| CIVE 7220 | Construction Management | |
| CIVE 7250 | Environmental Chemistry | |
| CIVE 7251 | Environmental Biological Processes | |
| CIVE 7255 | Environmental Physical/Chemical Processes | |
| CIVE 7260 | Hydrologic Modeling | |
| CIVE 7382 | Advanced Traffic Control and Simulation | |
| EECE 5642 | Data Visualization | |
| EECE 5644 | Introduction to Machine Learning and Pattern Recognition | |
| EECE 7204 | Applied Probability and Stochastic Processes | |
| IE 5617 | Lean Concepts and Applications | |
| IE 7215 | Simulation Analysis | |
| SBSY 5300 | Information Systems for Integrated Project Delivery | |

## Program Credit/GPA Requirements

32 total semester hours required
Minimum 3.000 GPA required