# MS CIVIL AND ENVIRONMENTAL ENGINEERING

## Program Learning Objectives

1. Apply and synthesize technical knowledge to solve solutions to advanced Civil and Environmental Engineering problems in a chosen subject area of mastery (Environmental, Geotechnical, Structural, Water Resources, or Transportation Engineering).
2. Demonstrate the ability for lifelong learning necessary for the constantly evolving nature of engineering design and practice.
3. Effectively communicate technical information orally and in writing.
4. Demonstrate independent thinking and decision making skills.
5. Integrate ethical and professional components into the solutions of complex engineering problems.
6. Evaluate engineering systems for sustainable performance and create solutions to encompass a project's full lifecycle.

## Required Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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</thead>
<tbody>
<tr>
<td>CE 591</td>
<td>Graduate Seminar I</td>
</tr>
<tr>
<td>CE 592</td>
<td>Graduate Seminar II</td>
</tr>
</tbody>
</table>

Select one of the following options: 9

- CE/ENVE 599 Design Project (Thesis)

Or 9 units of advisor approved analysis and design electives within the major (nonthesis option)

## Advisor approved analysis and design electives within Civil and Environmental Engineering 3

Select from the following: 1

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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</thead>
<tbody>
<tr>
<td>CE 400</td>
<td>Special Problems 2</td>
</tr>
<tr>
<td>CE 401</td>
<td>Advanced Mechanics of Materials</td>
</tr>
<tr>
<td>CE 405</td>
<td>Concrete Materials</td>
</tr>
<tr>
<td>CE 407</td>
<td>Structural Dynamics</td>
</tr>
<tr>
<td>CE 421</td>
<td>Traffic Engineering</td>
</tr>
<tr>
<td>CE 422</td>
<td>Highway Geometrics and Design</td>
</tr>
<tr>
<td>CE 423</td>
<td>Intelligent Transportation Systems</td>
</tr>
<tr>
<td>CE 424</td>
<td>Public Transportation</td>
</tr>
<tr>
<td>CE 429</td>
<td>Highway Pavement Designs</td>
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<tr>
<td>CE 431</td>
<td>Coastal Hydraulics I</td>
</tr>
<tr>
<td>CE 432</td>
<td>Coastal Hydraulics II</td>
</tr>
<tr>
<td>CE 433</td>
<td>Open Channel Hydraulics</td>
</tr>
<tr>
<td>CE 434</td>
<td>Groundwater Hydraulics and Hydrology</td>
</tr>
<tr>
<td>CE 440</td>
<td>Hydraulic Systems Engineering</td>
</tr>
<tr>
<td>CE 454</td>
<td>Integrated Structural Design</td>
</tr>
<tr>
<td>CE 455</td>
<td>Design of Timber Structures</td>
</tr>
<tr>
<td>CE 457</td>
<td>Bridge Engineering</td>
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<tr>
<td>CE 458</td>
<td>Fiber Reinforced Polymer (FRP) Design</td>
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<tr>
<td>CE 459</td>
<td>FRP Strengthening of Reinforced Concrete Structures</td>
</tr>
<tr>
<td>CE 475</td>
<td>Civil Infrastructure and Building Systems</td>
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</tbody>
</table>

## CE 481
- Analysis and Design of Shallow Foundations

## CE 486
- Introduction to Geological Engineering

## CE 487
- Design of Foundations and Slopes in Rock

## CE 488
- Engineering Risk Analysis

## CE 500
- Individual Study 2

## CE 501
- Advanced Matrix Analysis of Structures

## CE 504
- Finite Element Analysis

## CE 523
- Transportation Systems Planning

## CE 525
- Airport Planning and Design

## CE 527
- Sustainable Mobility

## CE 528
- Transportation Economics and Analysis

## CE 529
- Modeling and Simulation in Transportation

## CE 533
- Advanced Water Resources Engineering

## CE 535
- Water Resources Systems Planning and Analysis

## CE 537
- Groundwater Contamination

## CE 539
- Environmental Hydraulics

## CE 552
- Analysis and Seismic Design of Reinforced Concrete

## CE 553
- Ductile Design of Steel Structures

## CE 555
- Advanced Civil Engineering Materials Laboratory

## CE 557
- Seismic Analysis and Design

## CE 559
- Prestressed Concrete Design

## CE 571
- Selected Advanced Laboratory

## CE 581
- Advanced Geotechnical Engineering

## CE 583
- Geotechnical Earthquake Engineering

## CE 584
- Lateral Support Systems

## CE 585
- Slope Stability Analysis

## CE 586
- Analysis and Design of Deep Foundations

## CE 588
- Ground Improvement

## CE 589
- Geosynthetics Engineering

## ENVE 400
- Special Problems 2

## ENVE 411
- Air Pollution Control

## ENVE 421
- Mass Transfer Operations

## ENVE 434
- Water Chemistry and Water Quality Measurements

## ENVE 436
- Introduction to Hazardous Waste Management

## ENVE 438
- Water and Wastewater Treatment Design

## ENVE 439
- Sustainable Solid Waste Engineering

## ENVE 443
- Bioremediation Engineering

## ENVE 450
- Industrial Pollution Prevention

## ENVE 455
- Environmental Health and Safety

## ENVE 466
- Senior Project Design Laboratory I
<table>
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<tbody>
<tr>
<td>ENVE 467</td>
<td>Senior Project Design Laboratory II</td>
</tr>
<tr>
<td>ENVE 480</td>
<td>Environmental Engineering of Energy</td>
</tr>
<tr>
<td>ENVE 500</td>
<td>Individual Study ²</td>
</tr>
<tr>
<td>ENVE 535</td>
<td>Physico-Chemical Water and Wastewater Treatment</td>
</tr>
<tr>
<td>ENVE 536</td>
<td>Biological Wastewater Treatment Processes Engineering</td>
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<tr>
<td>ENVE 537</td>
<td>Decentralized Wastewater Management</td>
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<tr>
<td>ENVE 542</td>
<td>Sustainable Environmental Engineering</td>
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</table>

**Advisor approved electives outside of Civil and Environmental Engineering** ³

<table>
<thead>
<tr>
<th>Elective Type</th>
<th>Units</th>
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<tbody>
<tr>
<td>Non-CE/ENVE advisor approved electives ¹</td>
<td>0-14</td>
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</tbody>
</table>

**Total units** 45

¹ To be selected after consultation with your academic advisor and the CE/ENVE graduate coordinator

² No more than 4 total units of technical elective credit from CE 400, CE 500 and ENVE 400, ENVE 500 combined.

³ In total, at least 27 units of advisor approved electives (both within and outside of Civil and Environmental Engineering) must be at the 500 level.