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</th>
<th>Title</th>
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<tbody>
<tr>
<td>CE 591</td>
<td>Graduate Seminar I</td>
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<tr>
<td>CE 592</td>
<td>Graduate Seminar II</td>
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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 a specific area of focus

Select from the following: 1

- CE 400 Special Problems
- CE 401 Advanced Mechanics of Materials
- CE 405 Concrete Materials
- CE 407 Structural Dynamics
- CE 421 Traffic Engineering
- CE 422 Highway Geometrics and Design
- CE 423 Intelligent Transportation Systems
- CE 424 Public Transportation
- CE 431 Coastal Hydraulics I
- CE 432 Coastal Hydraulics II
- CE 433 Open Channel Hydraulics
- CE 434 Groundwater Hydraulics and Hydrology
- CE 440 Hydraulic Systems Engineering
- CE 454 Structural Design
- CE 455 Design of Timber Structures
- CE 456 Seismic Principles for Civil and Environmental Engineering
- CE 457 Bridge Engineering
- CE 458 Fiber Reinforced Polymer (FRP) Design
- CE 459 FRP Strengthening of Reinforced Concrete Structures

CE 475 Civil Infrastructure and Building Systems
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
CE 501 Advanced Matrix Analysis of Structures I
CE 504 Finite Element Analysis
CE 521 Highway Pavement Designs
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 for Civil Engineers
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
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
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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>ENVE 450</td>
<td>Industrial Pollution Prevention</td>
</tr>
<tr>
<td>ENVE 455</td>
<td>Environmental Health and Safety</td>
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<tr>
<td>ENVE 466</td>
<td>Senior Project Design Laboratory I</td>
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<tr>
<td>ENVE 467</td>
<td>Senior Project Design Laboratory II</td>
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<tr>
<td>ENVE 500</td>
<td>Individual Study ²</td>
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<tr>
<td>ENVE 535</td>
<td>Physico-Chemical Water and Wastewater Treatment</td>
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<tr>
<td>ENVE 536</td>
<td>Biological Wastewater Treatment Engineering</td>
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<tr>
<td>ENVE 542</td>
<td>Sustainable Environmental Engineering</td>
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**Advisor approved electives outside the primary area of focus**

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<thead>
<tr>
<th>Approved electives outside the primary area of focus</th>
<th>8-14</th>
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<tbody>
<tr>
<td><strong>Total units</strong></td>
<td>45</td>
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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.