ENVIRONMENTAL AND SUSTAINABILITY ENGINEERING (M.S.)

The Master of Science in Environmental and Sustainability Engineering aims to advance environmental engineering and sustainability to enhance human well-being through the development, application, and dissemination of relevant knowledge. The curriculum is arranged into four themes:

1. Systems & Resources – topics within this area vary in scale and include: modeling of groundwater, surfacewater, and air systems; engineered systems such as drinking water distributions systems; and interactions between the environment and urban systems (e.g. stormwater management).
2. Treatment & Sensing Technologies – topics within this area focus on the mitigation and quantification of pollutants loads to the environment, including humans, within all media (air, water, soils).
3. Bio-chemical-physical Processes – topics within this area focus on fundamental process that control the fate and transport of pollutants, including remediation techniques.
4. Environmental Exposure and Risk – topics within this area focus on identifying, quantifying and reducing risk.

Admission Requirements

Admission to this program is contingent upon admission to the Graduate School (http://bulletins.wayne.edu/graduate/general-information/admission).

The M.S. in Environmental and Sustainability Engineering will admit students with bachelor's degrees or the equivalent in engineering and other qualified science programs if there is a demonstrated aptitude for quantitative analysis. The degree program is suitable for new or recent graduates, as well as experienced professionals. Students will be required to have significant mathematics-based science capabilities. As noted above, field/professional experience will be viewed positively in the application review process.

The M.S. in Environmental and Sustainability Engineering requires a minimum of thirty credits under one of two degree plans approved by the College of Engineering:

Plan A: consists of a minimum of twenty-four credit hours of course-work in combination with a minimum of six credits of thesis.

Plan C: consists of a minimum of thirty credits of course-work.

The program is designed to provide graduates a core of systems, treatment, process, and exposure/risk skills in research and applied situations.

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<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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Students must take at least one course from each of the four foundational areas described below:

**Fluids Foundational Area:**
- CE 6130 Open Channel Hydraulics
- CE 6150 Hydrologic Analysis and Design
- CE 6190 Groundwater

**Chemistry Foundational Area:**
- CE 5220 Environmental Chemistry

**Biology Foundational Area:**
- CE 7280 Applied Environmental Microbiology

**Statistics Foundational Area:**
- CE 7070 Risk and Reliability in Civil Engineering
- CE 7080 Civil Engineering Research Methods

**Additional Civil Engineering Course Options:**
- CE 5230 Water Supply and Wastewater Engineering
- CE 5410 Energy, Emissions, Environment (E3) Design
- CE 5510 Geotechnical Engineering I
- CE 5520 Geotechnical Engineering II
- CE 5995 Special Topics in Civil Engineering I
- CE 6270 Sustainability Assessment and Management
- CE 6580 Geoenvironmental Engineering I
- CE 6910 Pharmaceutical Waste: Environmental Impact and Management
- CE 7190 Groundwater Modeling
- CE 7220 Industrial Waste Treatment
- CE 7221 Advanced Environmental Chemistry
- CE 7260 Surface Water-Quality Modeling and Management
- CE 7311 Sustainability of Urban Environmental Systems
- CE 7500 Engineering Properties of Soils
Students may also take up to 9 credits from the following electives (as approved by advisor):

<table>
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<tr>
<th>Code</th>
<th>Course Name</th>
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<tbody>
<tr>
<td>CHE 7200</td>
<td>Advanced Transport Phenomena</td>
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<tr>
<td>ME 5300</td>
<td>Intermediate Fluid Mechanics</td>
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<tr>
<td>ME 7300</td>
<td>Advanced Fluid Mechanics</td>
</tr>
<tr>
<td>ME 7310</td>
<td>Computational Fluid Mechanics and Heat Transfer</td>
</tr>
<tr>
<td>IE 6210</td>
<td>Applied Engineering Statistics</td>
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<tr>
<td>IE 6270</td>
<td>Engineering Experimental Design</td>
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<tr>
<td>BIO 5100</td>
<td>Aquatic Ecology</td>
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<tr>
<td>MAT 5070</td>
<td>Elementary Analysis</td>
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<tr>
<td>MAT 5770</td>
<td>Mathematical Models in Operations Research</td>
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<td>MAT 5870</td>
<td>Methods of Optimization</td>
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The graduation requirement is completion of the M.S. courses with an overall GPA of 3.00 or higher. All core classes in the program must be completed with a 3.00 score or better. And all course work must be completed in accordance with the regulations of the Graduate School (http://bulletins.wayne.edu/graduate/general-information/academic-regulations) and the College of Engineering (http://bulletins.wayne.edu/graduate/college-engineering/academic-regulations).