# Dual-Master’s Degree Program
## Summary of Requirements for a Master of Science in Sustainable Systems and a Master of Science in Engineering (Environmental Engineering)

### Effective Fall 2021

<table>
<thead>
<tr>
<th>2-2.5 Year MS &amp; MSE Plan</th>
<th>Requirement</th>
<th>Notes</th>
<th>Course #</th>
<th>Credits</th>
<th>Term</th>
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<tbody>
<tr>
<td>Engineering Core</td>
<td>Environmental Engineering Core</td>
<td>18CR in CEE courses at the 500 or 600 level&lt;br&gt;6CR in additional CEE courses</td>
<td>Required: CEE 581&lt;br&gt;Cee 582&lt;br&gt;Cee 591&lt;br&gt;Cee 881 (1st Fall in program)&lt;br&gt;And one course from List A (next page) *</td>
<td>CEE 581&lt;br&gt;CEE 582&lt;br&gt;CEE 591&lt;br&gt;Cee 881&lt;br&gt;Cee 880</td>
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<tr>
<td>Sustainable Energy Systems Major</td>
<td></td>
<td>12CR from, the “Sustainable Energy Systems” Major</td>
<td>CEE 567 and 9CR from List A (see next page)</td>
<td>CEE 567</td>
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<tr>
<td>Advanced Math Requirement</td>
<td></td>
<td>3CR in approved Mathematics or equivalent</td>
<td>See Env. Eng dept. requirements and Cognates (next page)</td>
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<tr>
<td>School for Environment and Sustainability</td>
<td>SS Core</td>
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<td></td>
<td></td>
<td>6CR in Systems Analysis for Sustainability</td>
<td>Required: EAS 557/CEE 586</td>
<td>CEE 586</td>
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<td></td>
<td></td>
<td>9CR total</td>
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<td></td>
<td>Sustainable Design &amp; Technology&lt;br&gt;Minimum. 3CR</td>
<td>Required: EAS 574&lt;br&gt;See List 2 for other acceptable courses</td>
<td>EAS 574</td>
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<td></td>
<td>Sustainable Enterprise&lt;br&gt;Minimum 3CR</td>
<td>See List 3 for acceptable courses</td>
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<td></td>
<td>Additional 3CR minimum from list</td>
<td>See attached list (A1-3) of acceptable courses in these specializations</td>
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<td></td>
<td>School for Environment and Sustainability</td>
<td>EAS Core</td>
<td>EAS 509 (Natural Systems Core)&lt;br&gt;EAS 510(Social Systems Core) or 3CR from the *Social Systems Distribution list</td>
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<td>*IAMS Requirement&lt;br&gt;Two courses; 3CR minimum</td>
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<td>Analytics</td>
<td>One statistics course</td>
<td>EAS 538 or equivalent required</td>
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<td>Capstone</td>
<td>Master’s Project/Thesis/Practicum</td>
<td>At most 6 credit hours of EAS 701 (Master’s Project) or EAS 702 (Master’s Practicum) or At most 12 credits of EAS 700 (Master’s Thesis)</td>
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<td>TOTALS</td>
<td>Total “EAS” credits - 25</td>
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<tr>
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<td>TOTALS</td>
<td>Total “CEE” credits - 18</td>
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<td>54 credits total for both</td>
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* *IAMS and Social Systems Distribution courses can double-count with Core requirements but we do not double-count the actual credits.*
**A) Sustainable Energy Systems**

**Required:**

CEE 567  
Energy Infrastructure Systems

*Choose at least two of the following:*

- CEE 526  
Design of Hydraulic Systems
- CEE 549  
Geoenvironmental Engineering
- CEE 555  
Sustainability of Civil Infrastructure Systems
- CEE 563  
Air Quality Engineering Fundamentals
- CEE 564  
Greenhouse Gas Control
- CEE 592  
Biological Processes in Environmental Engineering

*Choose one of the following, or a third course from the list above:*

- CEE 501  
Environmental Finance
- CEE 586 (EAS 557)  
Industrial Ecology
- CEE 686  
Case Studies in Environmental Sustainability
- CHE 548  
Electrochemical Engineering
- CHE 568  
Fuel Cells and Fuel Processors
- EAS 527 (BE 527)  
Energy Markets and Energy Politics
- EAS 573  
Environmental Footprinting and Input-Output Analysis
- EAS 574 (ESENG 599)  
Sustainable Energy Systems
- EAS 597  
Environmental Systems Analysis
- EECS 418  
Power Electronics
- EECS 419  
Electric Machinery and Drives
- EECS 463  
Power System Design and Operation
- EECS 498  
Grid Integration of Alternative Energy Sources
- EECS 598  
Infrastructure for Vehicle Electrification
- EHS 540  
Sustainability and Environmental Health
- MECHENG 433  
Advanced Energy Solutions
- MECHENG 571  
Energy Generation and Storage Using Modern Materials
- MECHENG 589  
Sustainable Design of Technology Systems
- NERS 531  
Nuclear Waste Management

*CEE 480 must be completed if an equivalent course has not been taken.*
EAS 501.009 (1.5CR)     Principles of Infrastructure Sustainability (F)
EAS 501.209 (1.5CR)     Advanced Infrastructure Systems (F)
EAS 615 (3CR)     Renewable Electricity and the Grid (W)
EAS 574/PUBPOL 519 (3cr)     Sustainable Energy Systems (F)
EAS 605/BA 605 (3cr)     Green Development (W)
EAS 677.023 (2)     Deep Decarbonization (W)
EAS 687 (4cr)     Landscape Planning (F)
ARCH 575 (3cr)     Building Ecology (F)
CEE 480 (3cr)     Design of Environ Engineering Systems (F)
CEE 582 (3cr)     Environmental Microbiology (F)
MECHENG 589 (3cr)     Sustainable Design of Technology Systems (W)

2)  Sustainable Enterprise (3CR)

EAS 525 (3cr)     Energy Justice (F)
EAS 501.035     Michigan Venture Club (W)
EAS 501.102 (3cr)     Renewable Energy at the State and Local Level (F)
EAS 535/BL 536 (2.25cr)     Ethics Corporate Management (TBD)
EAS 512/Strategy 564     Strategies for Sustainable Development I (F)
EAS 513/Strategy 565     Strategies for Sustainable Development II (F)
EAS 527/BE 527 (3cr)     Energy Markets and Energy Politics (F)
EAS 533 (3cr)     Negotiation Skills (F)
EAS 595/TO 560 (1.5)     Sustainable Operations and Supply Chain Management (W)
BE 555 (1.5)     Non-Market Strategy (F)
EAS 560/URP 544 (3cr)     Behavior and Environment (F)
EAS 576/CPE 588/ChemE 590 (3cr)     Sustainability Finance: Investment Model for Green Growth (F)
ENGR 521 (3cr)     CleanTech Entrepreneurship (W)
FIN 637 (2.25cr)     Finance and Sustainable Enterprises (F)
FIN 583 (1.5cr)     Energy Project Finance (W)

A)  Sustainable Systems Electives

B1) Additional SS courses (can count towards Non-Opus option)

EAS 572 (2cr)     Environmental Impact Assessment (F)
EAS 523 (3cr)     Environmental Risk Assessment (W)
EAS 552 (3cr)     Ecosystem Services (F)
EHS 672 (3cr)     Life Cycle Assessment: Human Health & Environ Impacts (F)
EAS 686/HMP 686/PubPol 563 (3cr)     Environmental Policy (W)
BA 612 (2.25cr)     Strategies for the Base of the Pyramid (F)
ESENG 501 (3cr)     Seminars in Energy Science, Technology, and Policy (F)
Econ 437 (3cr)     Energy Economics & Policy (W)
URP 553     Sustainable Urbanism and Architecture (F)

B2) Sustainable Systems Themes:

- Energy Systems
- Mobility Systems
- Water Systems
- Food Systems
- Built Environment
- Climate Change

Integrated Analytic Methods and Skills Requirement

Students are required, at some point during their time enrolled in the program, to take 2 courses composing at least 3 credits from a faculty-approved list of courses that focus on integrative analytic methods and skills.