## Effective Fall 2018

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Notes</th>
<th>Course #</th>
<th>Credits</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Engineering Core</strong></td>
<td>18CR in CEE courses at the 500 or 600 level</td>
<td>Required: CEE 581, CEE 582, CEE 591, CEE 881 (1st Fall in program) and one course from List A (next page) *</td>
<td>CEE 581, CEE 582, CEE 591, CEE 881, CEE 880</td>
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<tr>
<td><strong>Sustainable Energy Systems Major</strong></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><strong>Advanced Math Requirement</strong></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><strong>School for Environment and Sustainability</strong></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><strong>SS Core</strong></td>
<td>9CR total</td>
<td>Sustainable Design &amp; Technology Minimum. 3CR</td>
<td>EAS 574</td>
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<td></td>
<td></td>
<td>Required: EAS 574</td>
<td>See List 2 for other acceptable courses</td>
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<td>Sustainable Enterprise Minimum 3CR</td>
<td>See List 3 for acceptable courses</td>
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<td></td>
<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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<tr>
<td><strong>EAS Core</strong></td>
<td>EAS 509, EAS 510</td>
<td>IAMS Requirement Two courses; 3CR minimum Please see page 3 for</td>
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<tr>
<td><strong>Analytics</strong></td>
<td>One statistics course</td>
<td>EAS 538 or equivalent required</td>
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<tr>
<td><strong>Opus</strong></td>
<td>Master’s Project/Thesis/Practicum</td>
<td>At most 6CR of EAS 700/701</td>
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<tr>
<td><strong>TOTALS</strong></td>
<td>TOTAL CREDIT HOURS BY SCHOOL</td>
<td>“EAS” - Minimum 25CR</td>
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<tr>
<td><strong>TOTALS</strong></td>
<td>TOTAL CREDIT HOURS BY SCHOOL</td>
<td>“CEE” - Minimum 18CR</td>
<td>54 credits total for both</td>
<td></td>
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</tbody>
</table>
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.

A) Sustainable Systems Core (1-3)

1) Systems Analysis for Sustainability (at least 6CR*)

EAS 573 (3cr)  
Environ Footprinting and Environ Input-Output Analysis (W)
EAS 597 (3cr)  
Environmental Systems Analysis (F)
EAS 610 (1.5cr)  
Advanced LCA Methods & Software Tools (W)
EAS 557/CEE 586 (3cr)  
Industrial Ecology (W)
EAS 550/STRAT 566 (3cr)  
Systems Thinking for Sustainable Development (W)

*At least two courses need to be from the courses listed above

EAS 570 (3cr)  
Environ Economics: Quantitative Methods & Tools (F)
EAS 501 (1.5cr)  
Topics in Env. Economics (TBD)
EAS 531 (4cr)  
Principles of GIS (F&W)

2) Sustainable Design & Technology (3CR)

EAS 537 (3cr)  
Urban Sustainability (F)
EAS 501.087 (3CR)  
Technology and Community Sustainable Development (W)
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 (2cr)  Deep Decarbonization
EAS 687 (4cr)  Landscape Planning (F)
ARCH 575 (3cr)  Building Ecology (F)
CEE 460 (3cr)  Design of Environ Engineering Systems (F)
CEE 582 (3cr)  Environmental Microbiology (F)
CEE 686/ChE 686 (2-3cr)  Case Studies in Environ Sustainability (W)
MECHENG 589 (3cr)  Sustainable Design of Technology Systems (F)

3) Sustainable Enterprise (3CR)
EAS 530 (3cr)  Decision Making for Sustainability(W)
EAS 576/CEE 6588/ChE 590 (3cr)  Environmental Finance (F)
EAS 525 (3cr)  Energy Justice (F)
EAS 535/LHC 536 (2.25)  Ethics Corporate Management (TBD)
EAS 512/STRAT 564 (1.5)  Strategies for Sustainable Development I (F)
EAS 513/STRAT 565 (1.5)  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 Sustainable Operations and Supply Chain Management (W)
BE 555 (1.5)  Non Market Strategy (F)
EAS 560/UP 560 (3cr)  Behavior and Environment (F)
ENG 521 (3cr)  CleanTech Entrepreneurship (F)
FIN 637 (2.25cr)  Finance and Sustainable Enterprises (F)
FIN 583 (1.5cr)  Energy Project Finance (W)

B) 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)
EHS 672 (3cr)  Life Cycle Assessment: Human Health & Environ Impacts (F)
EAS 686/HMP 686/PubPol 563 (3cr)  Environmental Policy (W)
EAS 552 (3cr)  Ecosystem Services
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)
UP 533/ARCH 506 (3cr)  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. The faculty-approved existing courses that satisfy this requirement are listed below:

Fall

447 – Forest Ecology Management
501 – Ecological Restoration Applications
523 – Ecological Risk Assessment
530 - Decision-Making for Sustainability
531 – Principles of GIS
533 – Negotiation Skills
536 – Mediation Skills
552 – Ecosystem Services
553 – Diverse Farming Systems
564 – Localization Seminar
567 – Social Vulnerability & Adaptation to Environ Change
572 – Environmental Impact Assessment
570 – Environmental Economics
576 – Sustainability Finance
578 – Urban Stormwater
597 – Environmental Systems Analysis
677 – Climate Adaptation Seminar
687 – Landscape Planning

**Winter**

501 – Science and Management of the Great Lakes
501 – The Hydrologic Cycle and Water Res Mgmt
501 – Climate Economics & Policy
541 – Remote Sensing
549 – Analysis and Modeling of Ecological Data
550 – Systems Thinking for Sustainable Development
557 – Industrial Ecology
569 – Stakeholder Network Analysis
581 – Advanced Education for Environment and Sustainability
589 – Ecological Restoration
610 – Advanced LCA Methods and Software Tools
641 – Interdisciplinary Research Methods
787 – Metro Studio (MLA only)