### 2 Year MS & MSE Plan

<table>
<thead>
<tr>
<th>Requirement*</th>
<th>Notes</th>
<th>Course #</th>
<th>Credits</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Environmental Engineering Core</strong></td>
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<tr>
<td>18CR from the Civil and Environmental Engineering Department</td>
<td>Required: CEE 581, CEE 582, CEE 591, CEE 881 (1st Fall in program)</td>
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<tr>
<td>12CR from within one of the following Environmental Engineering Majors: (courses on next page)</td>
<td>Choose one: A) Ecohydrology B) Water Quality Process Engineering C) Water Quality and Resources Engineering</td>
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<tr>
<td>3CR of approved Mathematics</td>
<td>See Env. Eng. dept. requirements and Cognates (3rd page)</td>
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<tr>
<td><strong>School for Environment and Sustainability</strong></td>
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<tr>
<td><strong>SS CORE</strong></td>
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<tr>
<td>6CR in Systems Analysis for Sustainability</td>
<td>Required: EAS 557/CEE 586</td>
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<td>EAS 557</td>
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<tr>
<td>Sustainable Design &amp; Technology</td>
<td>Required: See List A2 for acceptable courses</td>
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<tr>
<td>Minimum 3CR</td>
<td>Sustainable Enterprise</td>
<td>See List A3 for acceptable courses</td>
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<tr>
<td>9CR total</td>
<td>Minimum 3CR</td>
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<tr>
<td>Additional 3CR minimum from list A1, 2, or 3</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>
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<td>EAS 509</td>
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<td>EAS 510</td>
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<tr>
<td>IAMS Requirement</td>
<td>Two courses; 3CR minimum</td>
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<td><strong>Analytics</strong></td>
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<tr>
<td>3CR in Analytics</td>
<td>EAS 538 or equivalent required:</td>
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<td><strong>Opus</strong></td>
<td>Students are not expected to complete an Opus, but could petition to do a thesis/practicum or project*</td>
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<td>At most 6CR of EAS 700/701</td>
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<td><strong>TOTALS</strong></td>
<td>MINIMUM CREDIT HOURS BY SCHOOL</td>
<td>“EAS” – Minimum 25CR</td>
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<tr>
<td><strong>TOTALS</strong></td>
<td>MINIMUM CREDIT HOURS BY SCHOOL</td>
<td>“CEE” – Minimum 18CR</td>
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<td>54 credits total for both</td>
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*Any waiver or substitution of degree requirement must be approved by the appropriate faculty and submitted to OAP.
Environmental Engineering

A)  Ecohydrology
    Choose four:
    CEE 428 – Introduction to Groundwater Hydrology
    CEE 520 – Deterministic & Stochastic Models in Hydrology
    CEE 521 – Open Channel Flow
    CEE 522 – Sediment Transport
    CEE 524 – Environmental Turbulence
    or
    CEE 525 – Turbulent Mixing in Buoyant Flows
    CEE 527 – Coastal Hydraulics
    CEE 590 – Stream, Lake, and Estuary Analysis
    CEE 593 – Environmental Soil Physics
    CEE 624 – Restoration Fundamentals & Practice in Aquatic Systems

B)  Water Quality Process Engineering
    Required:
    CEE 580 – Physical Chemical Processes in Environmental Engineering
    CEE 592 – Biological Processes in Environmental Engineering
    Choose two:
    CEE 428 – Introduction to Groundwater Hydrology
    CEE 583 – Surface & Interfaces in Aquatic Systems
    CEE 593 – Environmental Soil Physics
    CEE 594 – Environmental Soil Chemistry
    CEE 693 – Environmental Molecular Biology
    Approved CHEM or BIOLCHEM or ChE or AOSS elective

C)  Water Quality and Resources Engineering
    Choose at least one:
    CEE 521 – Open Channel Flow
    CEE 522 – Sediment Transport
    Choose at least one:
    CEE 580 – Physical Chemical Processes in Environmental Engineering
    CEE 592 – Biological Processes in Environmental Engineering
    Choose up to two (only one of CEE 524 or CEE 525 may be taken):
    CEE 428 – Introduction to Groundwater Hydrology
    CEE 501.041 Decentralized Water Supply, Hygiene, and Sanitation
    CEE 520 – Deterministic and Stochastic Models in Hydrology
    CEE 524 – Environmental Turbulence
    or
    CEE 525 – Turbulent Mixing in Bouyant Flows
    CEE 526 – Design of Hydraulic Systems
    CEE 573 Data Analysis
    CEE 597 Environmental Organic Chemistry
    CEE 624 – Restoration Fundamentals & Practice in Aquatic Systems

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)
EAS 501.087 (3CR)
EAS 615 (3CR)
EAS 574/PUBPOL 519 (3cr)
EAS 605/BA 605 (3cr)
EAS 677.023 (2cr)
EAS 687 (4cr)
ARCH 575 (3cr)
CEE 460 (3cr)
CEE 582 (3cr)
CEE 686/ChE 686 (2-3cr)
MECHENG 589 (3cr)

Urban Sustainability (F)
Technology and Community Sustainable Development (W)
Renewable Electricity and the Grid (W)
Sustainable Energy Systems (F)
Green Development (W)
Deep Decarbonization
Landscape Planning (F)
Building Ecology (F)
Design of Environ Engineering Systems (F)
Environmental Microbiology (F)
Case Studies in Environ Sustainability (W)
Sustainable Design of Technology Systems (F)

3) Sustainable Enterprise (3CR)

EAS 530 (3cr)
EAS 576/CEE 6588/ChE 590 (3cr)
EAS 525 (3cr)
EAS 535/LHC 536 (2.25)
EAS 512/STRAT 564 (1.5)
EAS 513/STRAT 565 (1.5)
EAS 527/BE 527 (3cr)
EAS 533 (3cr)
EAS 595/TO 560
BE 555 (1.5)
EAS 560/UP 560 (3cr)
ENGR 521 (3cr)
FIN 637 (2.25cr)
FIN 583 (1.5cr)

Decision Making for Sustainability(W)
Environmental Finance (F)
Energy Justice (F)
Ethics Corporate Management (TBD)
Strategies for Sustainable Development I (F)
Strategies for Sustainable Development II (F)
Energy Markets and Energy Politics (F)
Negotiation Skills (F)
Sustainable Operations and Supply Chain Management (W)
Non Market Strategy (F)
Behavior and Environment (F)
CleanTech Entrepreneurship (F)
Finance and Sustainable Enterprises (F)
Energy Project Finance (W)

B) Sustainable Systems Electives

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

EAS 572(2cr)
EAS 523(3cr)
EHS 672 (3cr)
EAS 686/HMP 686/PubPol 563 (3cr)
EAS 552 (3cr)
BA 612 (2.25cr)
ESENG 501 (3cr)
Econ 437 (3cr)
UP 533/ARCH 506 (3cr)

Environmental Impact Assessment (F)
Environmental Risk Assessment (W)
Life Cycle Assessment: Human Health & Environ Impacts (F)
Environmental Policy (W)
Ecosystem Services
Strategies for the Base of the Pyramid (F)
Seminars in Energy Science, Technology, and Policy (F)
Energy Economics & Policy (W)
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
545 – Applied Ecosystem Modeling (Winter B)
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)