

| 2 Year MS & MSE Plan | | Requirement* | Notes | Course # | Credits | Term | |
|---|--|---|--|--|---------|------|--|
| Engineering | Environmental Engineering Core | 18CR from the Civil and Environmental Engineering Department | Required: CEE 581 CEE 582 CEE 591 CEE 881 (1 st Fall in program) | CEE 881 | | | |
| | | | | CEE 581 | | | |
| | | | | CEE 582 | | | |
| | | | | CEE 591 | | | |
| | | 12CR from within one of the following Environmental Engineering Majors: (courses on next page) | Choose one: A) Ecohydrology B) Water Quality Process Engineering C) Water Quality and Resources Engineering | | | | |
| | | 3CR of approved Mathematics | See Env. Eng. dept. requirements and Cognates (3 rd page) | | | | |
| Natural Resources and Environment | SS CORE <i>[SS-specific requirements]</i> | 6CR in Systems Analysis for Sustainability | Required: NRE 557/CEE 586 And one course from List 1 (3 rd page) | NRE 557 | | | |
| | | 9CR total | Sustainable Design & Technology <i>Minimum 3CR</i> | Required: NRE 574 See List 2 for other acceptable courses (3 rd page) | NRE 574 | | |
| | | | Sustainable Enterprise <i>Minimum 3CR</i> | See List 3 for acceptable courses (3 rd page) | | | |
| | NRE Core <i>[School-wide requirement]</i> | NRE 509 NRE 510 NRE 580 | 10CR in total | | | | |
| | Analytics <i>[School-wide requirement]</i> | 3CR in Analytics | NRE 538 or equivalent required: http://www.snre.umich.edu/sites/snre.umich.edu/files/Statistic%20Courses%201108.pdf | | | | |
| | Opus* | Students are <u>not</u> expected to complete an Opus, but could petition to do a thesis/practicum or project* | At most 6CR of NRE 700/701 | | | | |
| Cognates <i>[Rackham requirement]</i> | | Please see 3 rd page for cognate requirement information | | | | | |
| TOTALS | TOTAL CREDIT HOURS BY SCHOOL | | "NRE" – Minimum 25CR | | | | |
| | | | "CEE" – Minimum 18CR | | | | |
| | TOTAL CREDIT HOURS | | Minimum 54 Credit Hours | | | | |

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 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 624 – Restoration Fundamentals & Practice in Aquatic Systems

Natural Resources and Environment Sustainable Systems

1) Systems Analysis for Sustainability (6 hrs) fulfills Analytics requirement

| | |
|--------------------------|---|
| NRE 531 (4) | Principles of GIS (W) |
| NRE 550/STRATEGY 566 (3) | Systems Thinking For Sustainable Development (W) |
| NRE 557/CEE 586 (3) | Industrial Ecology (W) |
| NRE 570 (3) | Microeconomics with Natural Resource Applications (W) |
| NRE 501.086 (3) | Topics and Tools in Environ Economics (W TBD) |
| NRE 501.092 | Environmental Systems Analysis (F) |

*Please note that only 1 (one) econ course can be counted under the Systems Analysis requirement

2) Sustainable Design and Technology (3-9hrs)

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|------------------------|--|
| NRE 574/PUBPOL 519 (3) | Sustainable Energy Systems (F) |
| NRE 576/UP 576 (3) | Ecological Design Approaches to Brownfield Redevelopment (F) |
| NRE 605/BA 605 (3) | Green Development (W) |
| NRE 687 (4) | Landscape Analysis and Planning |
| NRE 501.036 | Sustainable Systems in Developing Countries (W) |
| NRE 501.039 (3) | Land Use and Global Change (F) |
| Arch 575 (3) | Building Ecology (F) |
| CEE 460 (3) | Design of Environmental Engineering Systems (F) |
| CEE 582 (3) | Environmental Microbiology (F) |
| CEE 686/ChE 686 (2-3) | Case Studies in Environmental Sustainability (W) |
| ME 433 (3) | Advanced Energy Solutions (F,W) |
| ME 589 (3) | Sustainable Design of Technology Systems (F,W) |
| EECS 498 (3) | Grid Integration of Alternative Energy Sources (TBD) |

3) Sustainable Enterprise (3-9 hrs)

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|---------------------------|--|
| NRE 501.032 (3) | Transportation Energy & Climate (W) |
| NRE 512/BA 512 (1.5) | Ethics Corporate Management (F,W) |
| NRE 513/STRAT 564&565 (3) | Competitive Environmental Strategy (F) |
| NRE 527 (3) | Energy Markets and Energy Politics (F) |
| NRE 532 (3) | Natural Resources Conflict Management (F) |
| NRE 533 (3) | Negotiating Skills in Environmental Dispute Resolution (W) |
| BE 555 (1.5) | Non-Market Strategy (F) |
| NRE 560/UP 560/HB 710 (3) | Behavior and Environment: (F) |
| NRE 565 (3) | Principles of Sustainability (W) |
| NRE 605/BA 605 (3) | Green Development (W) |
| ENG 521 (3) | CleanTech Entrepreneurship (F) |
| FIN 637 (2.25) | Finance and Sustainable Enterprises (F) |
| ES 520 (1.5) | CleanTech Venture Opportunities (F) |
| STRATEGY 735-739 (1.5) | Environmental Management Topics (F,W) |

Cognates

SNRE – Minimum 4 credits outside SNRE. Can be fulfilled with CEE coursework.

CEE – 4 credits of non-CEE coursework. Can be fulfilled with one advanced Mathematics course (proper choice of SNRE analytical courses can also satisfy this requirement) and one SNRE course.