

Effective Fall 2014

2.5 YEAR MS & MSE PLAN		Requirement	Notes	Course #	Credits	Term	
Engineering	Mechanical Engineering Core	12CR in ME courses at the 500 or 600 level	Required Courses: ME 589 At least one course from Mechanical Engineering course list (next page)	ME 589			
		6CR in additional ME courses or research at 400 level or above	*ME option: • Coursework Only	ME 455			
		6CR in acceptable Mathematics or equivalent	Please see: ME Graduate Handbook				
Natural Resources and Environment	SS Core	6CR in Systems Analysis for Sustainability	Required Course: NRE 557/CEE 586 And one course from List A1 (next page)	NRE 557			
		9CR total	Sustainable Design & Technology <i>Minimum 3CR</i>	See List A2 for acceptable courses (next page)			
			Sustainable Enterprise <i>Minimum 3CR</i>	See List A3 for acceptable courses (next page)			
			Additional 3CR minimum from list A1, 2, or 3	See attached list (A1-3) of acceptable courses in these specializations			
	NRE Core	NRE 509 NRE 510					
		IAMS Requirement Two courses; 3CR minimum Please see page 3 for approved					
	Analytics	3CR in Analytics	NRE 538 or equivalent required				
Opus	Master's Project/Thesis/Practicum	At most 6CR of NRE 700/701					
Cognates <i>[Rackham requirement]</i>	Minimum 4 credit hours outside of degree program	Likely fulfilled by other <u>cross-listed</u> courses					
TOTALS	MINIMUM CREDIT HOURS BY SCHOOL	"NRE" - Minimum 25CR					
		"ME" - Minimum 18CR					
	TOTAL CREDIT HOURS	Minimum 54 Credit Hours					

*Please see the Mechanical Engineering Student Services Office if you would prefer to complete their Research or Thesis option.

Mechanical Engineering

MECHENG 555 (3)	Design Optimization (W)
MECHENG 577 (3)	Materials in Manufacturing and Design (W)
MECHENG 581 (3)	Global Product Development
MECHENG 587 (3)	Global Manufacturing (F)

A) Sustainable Systems Core (1-3)

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

NRE 573 (3cr)	Environ Footprinting & Environmental Input-Output Analysis (W)
NRE 610 (1.5cr)	Advanced LCA Methods & Software Tools (W)
NRE 597 (3cr)	Environmental Systems Analysis (F)
NRE 557/CEE 586 (3cr)	Industrial Ecology (W)
NRE 550/STRAT 566 (3cr)	Systems Thinking for Sustainable Development (W)
*At least two courses need to be from the courses listed above	
NRE 570 (3cr)	Environ Economics: Quantitative Methods & Tools (F)
NRE 501 (1.5cr)	Five courses on selected topics in Env. Economics (TBD)
NRE 531 (4cr)	Principles of GIS (F&W)

2) Sustainable Design & Technology (3CR)

NRE 537 (3cr)	Urban Sustainability (F)
NRE 501.087 (3cr)	Technology and Community Sustainable Development (W)
NRE 615 (3cr)	Renewable Electricity and the Grid (W)
NRE 574/PUBPOL 519 (3cr)	Sustainable Energy Systems (F)
NRE 548 (3cr)	Land Use and Global Change (F)
NRE 605/BA 605 (3cr)	Green Development (W)
NRE 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)
DESCI 502 (3)	Design Process Models (W)
DESCI 790 (1-4)	Design Science Colloquium (F or W)
EECS 498 (3)	Grid Integration of Alternative Energy Sources (TBD)

3) Sustainable Enterprise (3CR)

NRE 501.159 (3cr)	Decision Making for Sustainability (W)
NRE 512/LHC 536 (2.25)	Ethics Corporate Management (F or W)
NRE 513/STRAT 564&564 (3cr)	Strategies for Sustainable Development (F)
NRE 527/BE 527 (3cr)	Energy Markets and Energy Politics (F)
NRE 532 (3cr)	Natural Resources and Environ Conflict Management
NRE 533 (3cr)	Negotiation Skills (F)
BE 555 (1.5)	Non Market Strategy (F)
NRE 560/UP 560 (3cr)	Behavior and Environment (F)
ENGR 521 (3cr)	CleanTech Entrepreneurship (F)
NRE501.014/CEE686/ChE 686 (3cr)	Environmental Finance
FIN 637 (2.25cr)	Finance and Sustainable Enterprises (F)
STRAT 735-739 (1.5cr)	Topics in Global Sustainable Enterprise (F)
FIN 583 (1.5cr)	Energy Project Finance (W)

B) Sustainable Systems Electives

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

NRE 514 (2cr)	Environmental Impact Assessment (F)
NRE 523(3cr)	Environmental Risk Assessment (W)
NRE 552 (3cr)	Ecosystem Services (F)
EHS 672 (3cr)	Life Cycle Assessment: Human Health & Environ Impacts (F)

Last Revised

NRE 686/PUBPOL 563 (3cr)
BA 612 (2.25cr)
ESENG 501 (3cr)
Econ 437 (3cr)
UP 533/ARCH 506 (3cr)

Environmental Policy (W)
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 (see links for course listings):

Energy Systems - <http://www.snre.umich.edu/node/7746/#energy>
Mobility Systems - <http://www.snre.umich.edu/node/7746/#transportation>
Water Systems - <http://www.snre.umich.edu/node/7746/#water>
Food Systems - <http://www.snre.umich.edu/node/7746/#food>

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

501 – Social Vulnerability & Adaptation to Environ Change
578 – Urban Stormwater
552 – Ecosystem Services
514 – Environmental Impact Assessment
533 – Negotiation Skills (Fall A)
536 – Mediation Skills
548 – Land Use and Global Change
570 – Environmental Economics
597 – Environmental Systems Analysis
564 – Localization Seminar
677 – Climate Adaptation Seminar
687 – Landscape Planning

Winter

501 – Stakeholder Network Analysis
501 – Science and Management of the Great Lakes
501 – Decision Making for Sustainability
532 – Natural Resource Conflict Management
545- Applied Ecosystem Modeling
550 – Systems Thinking for Sustainable Development
557 – Industrial Ecology
581 – Advanced Environmental Education
589 – Ecological Restoration
610 – Advanced LCA Methods and Software Tools
641 – Interdisciplinary Research Methods
787 – Metro Studio (MLA only)