

University of Michigan
Engineering Sustainable Systems
Sustainable Energy Systems specialization

Dual-Master's Degree Program
 Summary of Requirements for a Master of Science
 (**Sustainable Systems**) and a Master of Science in
 Engineering (**Chemical Engineering**)

Effective Fall 2008

2.5 Year MS & MSE Plan		Requirement	Notes	Course #	Credits	Term			
Engineering	Chemical Engineering Core	21CR in ChE courses at the 500 level or higher	Required: All courses in List A (see next page) and At least two relevant 2-4CR courses At least one of the following: ChE 508/510/554 or an approved mathematics course outside the dept.	ChE 527					
				ChE 528					
				ChE 538					
				ChE 542					
				ChE 595					
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 (next page)	NRE 557					
				9CR total	Sustainable Design & Technology <i>Minimum 3CR</i>	Required: NRE 574 See List 2 for other acceptable courses (next page)	NRE 574		
					Sustainable Enterprise <i>Minimum 3CR</i>	See List 3 for acceptable courses (next 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* <i>[School-wide requirement]</i>	Master's Project/Thesis/Practicum	At most 6CR of NRE 700/701						
	Cognates <i>[Rackham requirement]</i>		Please see next page for cognate requirement information						
	TOTALS	TOTAL CREDIT HOURS BY SCHOOL		"NRE" - Minimum 25CR					
				"ChE" - Minimum 21CR					
		TOTAL CREDIT HOURS	Minimum 54 Credit Hours						

*Please see the Chemical Engineering Student Services Office if you would prefer to complete their Research or Thesis option instead of the Course Work only option.

Chemical Engineering

ChE 527 (3)	Fluid Flow (W)
ChE 528 (3)	Chemical Reactor Engineering (F)
ChE 538 (3)	Statistical and Irreversible Thermodynamics (W)
ChE 542 (3)	Heat and Mass Transport (F)
ChE 595 (1)	Chemical Engineering Research Survey (F)

And one of the following: ChE 508/510/554 or approved math course outside of department

Natural Resources and Environment**1) Systems Analysis for Sustainability (6 hrs)**

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 Environmental 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)

NRE 501.036 (3)	Sustainable Systems in Developing Countries (W)
NRE 501.039 (3)	Land Use and Global Change (F)
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
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)

NRE 512/BA 512 (1.5)	Ethics Corporate Management (F,W)
NRE 501.032 (3)	Transportation Energy & Climate Policy (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)
ENGR 521 (3)	CleanTech Entrepreneurship (F)
ES 520	CleanTech Venture Opportunities (F)
FIN 637 (2.25)	Finance and Sustainable Enterprises (F)
STRATEGY 735-739 (1.5)	Environmental Management Topics (F,W)

Cognates

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

ChE – Minimum of 2 non-ChE graduate level courses. Can be fulfilled with SNRE coursework.